NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

Leader/Follower Second Sourcing Strategy
as Implemented by the Joint Cruise
Missile Project Office

by

Rosemary Elaine Nelson

September 1980

Thesis Advisor: D. V. Lamm

Approved for public release; distribution unlimited

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Leader/Follower Second Sourcing Strategy as Implemented by the Joint Cruise Missile Project Office		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis; September 1980
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Rosemary Elaine Nelson		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		12. REPORT DATE September 1980
		13. NUMBER OF PAGES 155
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) Naval Postgraduate School Monterey, California 93940		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

1. Leader/Follower Second Sourcing
2. Major Weapon Systems Acquisition Strategy
3. Competition in Production
4. Second Sourcing
5. Joint Cruise Missile Project Office

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The purpose of this study is to evaluate the Thompson-Rubenstein Leader/Follower Second Sourcing (T-RL/F) Model. The Model is applied to four acquisitions managed by the Joint Cruise Missile Project Office (JCMPO). The study reviews current DOD second sourcing acquisition policy and directives, and discusses alternate second sourcing techniques with emphasis on the Leader/Follower technique.

The results of this research indicate that the T-R L/F Model does not adequately address: (1) the competitive nature of the Aerospace Industry,

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
(Page 1) S/N 0102-014-6601

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Block 20:

(2) the timing of the second sourcing planning in relation to the Major Weapon System Acquisition Process, (3) the acquisition of technical data rights, and (4) L/F implementation variables. The researcher proposes an alternate Model based on the experiences of the JCMPO acquisitions. This Model will, most likely, be more valuable to a Program Manager dealing with the Aerospace Industry since it is based on aerospace acquisitions.

Approved for public release; distribution unlimited

Leader/Follower Second Sourcing Strategy as Implemented by the Joint Cruise Missile Project Office

by

Rosemary Elaine Nelson
Lieutenant Commander, Supply Corps, United States Navy
B.S., Fort Wright College, 1970

Submitted in partial fulfillment of
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

Naval Postgraduate School
September 1980

ABSTRACT

The purpose of this study is to evaluate the Thompson-Rubenstein Leader/Follower Second Sourcing (T-R L/F) Model. The Model is applied to four acquisitions managed by the Joint Cruise Missile Project Office (JCMPO). The study reviews current DOD second sourcing acquisition policy and directives, and discusses alternate second sourcing techniques with emphasis on the Leader/Follower technique.

The results of this research indicate that the T-R L/F Model does not adequately address: (1) the competitive nature of the Aerospace Industry, (2) the timing of the second sourcing planning in relation to the Major Weapon System Acquisition Process, (3) the acquisition of technical data rights, and (4) L/F implementation variables. The researcher proposes an alternate Model based on the experiences of the JCMPO acquisitions. This Model will, most likely, be more valuable to a Program Manager dealing with the Aerospace Industry since it is based on aerospace acquisitions.

TABLE OF CONTENTS

I. INTRODUCTION

A. GENERAL

For many years there has been a growing concern within the Congress and the Department of Defense (DOD) over the constantly rising costs of acquiring and operating current weapon systems. DOD testimony during the 1976 Appropriation hearings brought out [42:1]:

-- The then-estimated unit cost of the XM-1 tank was seven times that of the World War II Sherman tank.
-- The aircraft carrier Enterprise, in the early 1960s, cost nearly ten times more than the World War II Essex...
-- The unit cost of both the F-14 and F-15 fighter aircraft, in the 1970s, were more than ten times the cost of the early 1950s F-84F.

These rising costs can be attributed to many factors such as increased capability, technological innovations, and inflation. However, cost growth over the baseline (development) estimate greatly contribute to these rising costs. In recent testimony before the House Committee on Government Operations, Jerome A. Stolarow, Director, Procurement and Systems Acquisition Division of the General Accounting Office stated [33:1]:

> At March 31, 1979, there were 58 major acquisitions in development and production and reported in the DOD Selected Acquisition Reporting (SAR) System. These systems had current estimated costs of $235 billion, of which the Congress must fund nearly $127 billion, $97 billion represents cost growth over baseline [development] estimates.

The cost growth of $97 billion represents a 41 percent increase over the development estimates. In light of the above facts, there has been a concerted effort by Congress and DOD to reduce cost growth in the Major Systems Acquisition arena.

One reason often cited for cost growth is the lack of the "...pressure of true price competition as a motivating force to improve productivity and reduce contractors' costs... [42:17] especially in the production of major systems. In an effort to increase competition in production contracts, DOD has been exploring methods to qualify two or more contractors to produce a weapon system. Recently, DOD has sponsored research into possible second sourcing techniques including the Leader/Follower methodology. Under the sponsorship of the Air Force, Charles W. N. Thompson and Albert H. Rubenstein developed a Leader/Follower Second Sourcing Model. The purpose of this model is to provide "the basis for decisions concerning when and how to use the method" [34:ii].

B. OBJECTIVES OF THE RESEARCH

The basic objective of this study is to evaluate the Leader/Follower (L/F) Second Sourcing Model developed by Charles W. N. Thompson and Albert H. Rubenstein of International Applied Science and Technology Associates, Inc. (IASTA). This study will analyze and evaluate whether the Thompson-Rubenstein L/F Model accurately identifies crucial variables

or parameters so that a program manager may easily tailor the model to his/her project, thus making it a viable management tool.

In order to evaluate the model, this researcher will explore the use of the L/F Acquisition Strategy as implemented by the Joint Cruise Missile Project Office (JCMPO). The cruise missile, a strategic weapon system, is a small pilotless airplane, powered by jet engines that may be launched from land, sea or air.

C. RESEARCH QUESTIONS

In light of the above general objective the following research question was addressed:

> What are the significant aspects of applying the Thompson-Rubenstein Leader/Follower Second Sourcing Model (T-R L/F Model)?

In answering this research question, the following subsidiary research questions were addressed:

1. What is the Leader/Follower Concept and what are the critical factors attendant to its use?

2. What are the major features of the Thompson-Rubenstein Leader/Follower Model (T-R L/F Model)?

3. What are the major features of the Joint Cruise Missile Project (JCMP) that lend themselves to the use of the Leader/Follower Acquisition strategy?

4. What are the critical aspects of tailoring the Thompson-Rubenstein Model for application to the Joint Cruise Missile Project (JCMP)?

D. RESEARCH METHODOLOGY

The information presented in this study was obtained from (1) currently available literature, (2) telephonic and personal

discussions held with the Joint Cruise Missile Project Office (JCMPO) personnel, (3) informal discussions held with various Government (JCMPO) contractors currently involved in Leader/Follower Acquisitions, and (4) contractors who hoped to become Followers in proposed L/F JCMPO acquisitions.

The literature base utilized in this study was compiled from current and proposed Department of Defense (DOD) acquisition directives and instructions, JCMPO Procurement Plans and Acquisition Strategy briefings, Defense Logistics Studies Information Exchange (DLSIE), the Naval Postgraduate School Library, previous theses, and a review of current publications and periodicals.

E. SCOPE OF THE STUDY

The scope of this study is limited to major weapon systems acquisition related to the Aerospace Industry and to buys of major components of such systems. Specifically, this study will focus on the second sourcing acquisition strategy of Leader/Follower as implemented by the Joint Cruise Missile Project Office.

F. LIMITATIONS

This study is limited in that the JCMPO Leader/Follower Acquisitions explored in this thesis are on-going concerns and in the case of the Digital Scene Matching Area Correlation (DSMAC) buy, the acquisition strategy is in the planning phase. Therefore, the complete cycle of planning, implementing and

controlling the Leader/Follower acquisition cannot be discussed in terms of experience. However, it is the opinion of this researcher that successful L/F implementation and controlling is heavily dependent on the planning phase.

G. ASSUMPTIONS

Throughout this thesis, it is assumed that the reader has a basic knowledge of DOD contract language, methods of contracting, and contract types. It is further assumed that the reader is familiar with program manager concepts as utilized in the acquisition of major weapon systems.

H. ORGANIZATION OF THE STUDY

This thesis is organized in such a manner that the reader can assess the Thompson-Rubenstein Leader/Follower Second Sourcing Model in light of DOD policy and JCMPO implementation. Chapter II presents the framework for making a second sourcing decision stressing its importance as an acquisition strategy. Chapter III presents the definition of the Leader/Follower concept and factors that the program manager might consider prior to attempting Leader/Follower implementation. Chapter IV presents the salient characteristics of the Thompson-Rubenstein Leader/Follower (T-R L/F) Model. Chapter V discusses four Joint Cruise Missile acquisitions where L/F was used or considered for use as the Second Sourcing Strategy. Chapter VI discusses the advantages and/or disadvantages of the Thompson-Rubenstein Leader/Follower (T-R L/F) Model in

light of the Joint Cruise Missile Project Office experience. Chapter VII presents a modified L/F Model which reflects this experience. Finally, Chapter VIII presents the conclusions drawn from this research and provides recommendations for improving current acquisition instructions.

II. FRAMEWORK AND DEFINITIONS

A. THE MAJOR WEAPON SYSTEMS ACQUISITION PROCESS

Todays Acquisition Process in the Department of Defense (DOD) is directed and guided by the Office of Management and Budget (OMB) Circular A-109, Major Systems Acquisitions, as promulgated by the Office of Federal Procurement Policy (OFPP). Appendix A presents a graphic representation of this process. A-109 requires that the program manager develop an acquisition strategy which addresses the possibility of maintaining competition through all phases of the Acquisition Process. The Leader/Follower (L/F) technique has been recognized as one possible method for establishing and maintaining competition in production. Therefore, early consideration of second sourcing techniques for production, such as Leader/Follower, should be addressed at each major decision point. There are four major decision points which require agency head approval before program continuation.

The first critical decision point is the "Need Approval." The Mission Element Need Statement (MENS) is an "assessment of current or projected U.S. military capability to perform assigned missions" [38:8] and its primary objective is the identification of deficiencies, so that appropriate corrective action may be initiated. At this point, it must be made clear that the MENS does not identify how the deficiency is to be

corrected as it will be industry's responsibility to propose solutions during Phase O of the acquisition process.

With Secretarial approval of the MENS, Phase O of the cycle, Alternative System Concepts Exploration, is initiated. During this phase a program manager is appointed and the program is established. The program manager's first responsibility is to develop program objectives "...that set forth the capability [in mission need rather than equipment solution terms], cost, and schedule goals being sought in the system acquisition program" [25:10]. Once the objectives are established the program manager must develop an acquisition strategy that will ensure the efficient and effective accomplishment of these goals.

The acquisition strategy must be set forth in sufficient detail so as "...to permit competive exploration of alternatives systems design concepts." [38:9]. The plan should also address the program manager's intended use of competition in the production phase, as this may have a direct influence on the design efforts of the contractors. Acquisition Strategy Planning is an iterative process and the Acquisition Strategy will become more definitive as the program moves through the acquisition cycle.

Current directives stress front-end planning and promote the use of competition throughout the entire process. Phases O and I of the acquisition cycle are structured around design competition. Phase O requires that concepts be developed as to how the need identified in the MENS can be accomplished

in the most effective and economical manner. Both industry and Government laboratories are encouraged to propose their solutions. The Defense System Acquisition Review Council I (DSARC) reviews all proposals submitted and recommends to the Secretary of Defense the most promising concepts for further development. With the Secretary's approval and reaffirmation of the need, the program moves into Phase I of the Acquisition Cycle.

OFPP Pamphlet No. 1 describes Phase I, Competitive Demonstration, as follows:

> Competitive demonstrations are intended to verify that the chosen concepts are sound, perform in an operational environment, and provide a basis for selection of the system design concept(s) to be continued into full-scale development. Such demonstrations normally involve some type of prototypes -- these may range from a principle end item or critical subsystem, to a limited and less than complete development model [25:16].

The formalization and recognition of this phase was an evolutionary process.

> During the 1960s the DOD behaved as though choices between technical alternatives could reasonably be made solely on the basis of analysis and design studies, and that once program approval had been granted, the actual development and production of the system would proceed more or less smoothly and according to plan [31:4].

Current acquisition policies and directives are much more conservative and recommend hardware validation as the basis for selection between competing approaches.

At the completion of the demonstration phase, DSARC II evaluates the test results and recommends to the Secretary those contractor design(s) that should be awarded contract(s)

for Full-Scale Development (FSD) and testing. When the Secretary approves the DSARC II recommendations, he reaffirms the need and the program objectives, and the program moves into Phase II, Full-Scale Development, Test and Evaluation. Current directives encourage competitive full-scale development between similar or differing system design concepts whenever it is economically beneficial to do so.

At the completion of FSD and testing, DSARC III reviews the program and recommends production. It is at this point that the competitive environment established in Phases 0 through II might have to be abandoned due to the high cost of maintaining two competitive designs not only in terms of production costs but in terms of operation and maintenance costs. Therefore, at this point one design is usually selected for production. Historically, the selection of a winning design tended to put the winning contractor in a sole source position [2:360].

To a great extent this sole source phenomenon holds true today. This has long been recognized by acquisition managers as a problem. DOD Instruction 5000.2 states, "The program manager shall also consider means to increase the possibilities for competition during production" [38:14]. However, current directives and instructions do not clearly identify methods of maintaining competition in production, but, the program manager does have several options to consider. The main thrust of this thesis is to identify these options and how

one option, the Leader/Follower Strategy may be utilized to achieve a competitive environment in production. Before discussing these options, the benefits of competition in production should be discussed.

B. COMPETION IN PRODUCTION

1. Definition of Competition

Prior to the discussion of the benefits of competition, it is first necessary to define competition. The economist's definition is based on the concept of perfect competition. This concept assumes that four conditions exist [8:10-1]:

1. homogenous commodity
2. numerous buyers and sellers
3. perfect information about prevailing prices and bids
4. entry into and exit from the market can be accomplished in the long run

These conditions are rarely met in the general business environment but in major system acquisitions usually all of these conditions are violated especially during production buys of the system. To some extent, in the Government's viewpoint, the competitive environment is maintained in the design phase, with the encouragement of industry-wide conceptual proposals. However in production, the design is generally highly customized with only one producer capable of production and one buyer, the U.S. Government.

Since perfect competition cannot be achieved in business-Government transactions, the definition of competition can

be less stringently defined as a force which drives firms to reduce costs and become more efficient in order to maintain its market share of the Government business. This force might be described as "effective" competition [9:1]. For systems which are currently produced by a sole source, effective competition may be achieved by the introduction of a second source to produce the system or, perhaps, by merely the threat to introduce a viable second source.

2. Department of Defense Policy

A proposed change to the Defense Acquisition Regulations (DAR) (formerly known as the Armed Services Procurement Regulation (ASPR)) states [7:4]:

> General Policy. It is the policy of DOD to compete contracts for production with two or more manufacturers when such competition is likely to result in lower overall costs, improve quality, reduce production lead time or other benefits.. .. A determination to obtain production competition is an essential decision in the development of an acquisition strategy for a particular system, both at the prime and subcontract levels.

3. Benefits of Competition

Potential benefits to be derived from establishment of a second source in production include [7:4]:

a. The achievement of cost savings.

b. A broadening of the production base to

(1) maintain a viable source in areas of advanced technology.

(2) spread the effect of supply and demand fluctuations on the industrial base.

(3) improve mobilization capabilities.

c. Facilitate North Atlantic Treaty Organization (NATO) participation.

d. Facilitate the attainment of acquisition goals for small businesses and disadvantaged businesses.

e. Improve technical performance of equipment.

f. Improve delivery times and ensure against delays.

g. Competition for the sake of competition.

The above cited reasons are often quoted in current directives and literature on competition, however the program manager may further realize the benefit of increased contractor responsiveness to program goals and objectives.

By studying the above cited benefits, it is apparent that these goals may at times, depending on the particular program, be in conflict with each other. This is particularly true when considering cost versus the broadening or maintaining the production base. At times, it may be more economical to acquire a system from one company (the sole source producer) however the extent to which industrial production capability will be maintained is a decision not totally dependent alone on the costs involved. This is a widely recognized fact in the shipbuilding industry. Therefore cost is a secondary consideration. Cost may also be a secondary consideration when delivery and capacity are the primary considerations.

If cost savings is the primary goal in establishing effective competion then a cost savings analysis should be conducted to ensure that costs savings will be achieved. In studing various cost projection models, it was found that this analysis is not an easily accomplished task. The researcher has found that most analyses base their cost savings estimates on the difference between learning curve projections for sole source procurement and competitive procurement of the system. For competition to be cost effective, the estimated savings must equal or exceed the initial start-up costs for the second source. In making this type of analysis several critical assumptions were made by the cost models:

a. Duration of the program (total life of the program)

b. The yearly quantity to be procured

c. The minimum sustaining rate (the minimum production rate that permits a company to maintain a production capability for a particular system)

d. The projected slope of the learning curves for sole procurement and competitive procurement

e. The time it would take to qualify the second source.

The first three assumptions are heavily dependent on the stability of the program. That is, the estimated cost savings will only be achieved if the program is funded

at the projected quantity rate for the planned duration. this means the program must be consistently supported by both DOD and Congress.

The fourth assumption, learning curve projections, may be estimated based on industry averages for both competitive and sole source procurements [22].

The fifth assumption is heavily dependent on (1) the technical difficulty, (2) the timing of the second sourcing decision, and (3) the method used to establish the second source. Second Sourcing methods will be discussed in Section D of this Chapter.

C. CHARACTERISTICS OF THE AEROSPACE INDUSTRY

An indepth analysis of defense industries is beyond the scope of this thesis. However, a program manager considering enhancing or using effective competition in production should be aware of the general characteristics of the industry in which he/she will be dealing. As this thesis focuses on the aerospace industry, the general characteristics of the industry are discussed.

Any definition of the aerospace industry would be arbitrary. However, for this thesis, the following definition will apply [2:337]:

> The most common definition, . . ., would include only the suppliers of aircraft, missiles, space vehicles, and such supporting paraphernalia as guidance systems and special maintenance equipment.

The most striking characteristic of this industry is the use of high technology, and there is, therefore, great uncertainties concerning the product characteristics and the cost of the product.

> Because of these uncertainties and the large size of individual defense and space programs, special institutions [other than firm fixed-price type contracting] have been created to shift from producers to the government what might otherwise be intolerable financial risks [2:335].

By considering second sourcing techniques, the Government is attempting to shift back to industry some of the financial risks involved in the acquisition of major weapon systems [2:366].

The Government is very dependent on the industry for research and development. However, the industry does have excess capacity and is, therefore, very competitive for Government business especially in the design and development phase of the major system acquisition process. Profits are, generally, relatively low for this phase, because, in the past, the designer/developer has seen himself as a sole source producer and could capitalize on this position to recover any profits seen as "lost" in the development phase. Therefore, any attempt by the Government to use competition in production is seen as a threat to their basic philosophy of doing business [2:360-369].

Another aspect a program manager might consider is the interest of the industry in a particular program. This is directly related to the stability of the program and the

expected dollar value of the procurement. In general, an interested aerospace firm will "lobby" both the Congress and DOD to help ensure that a "desired" program is funded through production. If the firm perceives that support is lacking in either, then their interest will drop unless the technology might have future possibilities [2:369-377].

D. SECOND SOURCING TECHNIQUES

1. General

Second Sourcing refers to the process of qualifying a contractor other than the designer to produce a system or subsystem. Once the program manager decides that a second source should be established, he then must decide which method of second sourcing will most efficiently and effectively achieve his second sourcing objectives. Possible options that the program manager could consider are [29:40-48]:

a. Technical Data Package (TDP)

b. Form-Fit-Function (F^3)

c. Directed Licensing (DL)

d. Leader/Follower (L/F)

e. Contractor Teaming (CT)

f. Component Breakout

This section defines and discusses the methods the Joint Cruise Missile Project Office considered in establishing a second source with the exception of the L/F technique. The Leader/Follower methodology will be discussed in Chapter III.

2. Technical Data Package

Historically, TDP is the most well-known method of establishing a second source. When the Government contemplates second sourcing using this method, it procures the technical data from the designer/developer during the development or initial production phases. This technical package may be procured through the application of appropriate technical data rights clauses in the design phase of the system or by purchasing the rights from the designer at a later time in the production cycle. This technical data package is then used to solicit proposals for the system or subsystem on a stand alone basis. When this method is used, several conditions should exist [7:10]:

a. The Government does in fact have unlimited rights to the data in order to avoid future patent claims and/or copyright infringements.

b. A determination that the system is not so complex as to require technical assistance from the designer.

c. The technical data package is accurate and complete. This requires that the data package has been validated by the Government as the Government assumes the responsibility for inadequate and/or faulty specifications that make production impossible for the second source contractor.

3. Form-Fit-Function

This method of second sourcing does not require the use of the technical data of other designers/developers. The second source contractor is given performance specifications stating the required output. However, if the item to be procured is a subsystem, then the contractor must design the item so that it is interchangeable with the original designer's item. This is the classic engineering concept of the "black box." This method's major advantages are [39:40]:

a. Detailed design specifications are not necessary.

b. The Government is not required to procure the data from the original designer.

c. If the designer will not provide a complete data package or license to another contractor to produce the item, this feature is particularly advantageous.

The major disadvantages are [29:40]:

a. The Government must pay for a second design effort.

b. If field maintenance is contemplated, spare parts and personnel training must be considered as an additional expense.

4. Directed Licensing (DL)

This method, like the TDP method, requires the transfer of technical data from the designer to the second source contractor; however, it also entails the transfer of

manufacturing techniques and know-how of the designer to the second source contractor [7:11]. A further departure from the TDP method is that the designer is responsible for the accuracy and completeness of the technical data package, not the Government. Using this method, the designer is usually awarded the initial Production Contract with the requirement that he qualify a Government approved subcontractor who will in out years become capable of competing for production awards. Under this method, the designer is paid royalty fees on each unit the second source contractor produces for an agreed upon quantity and/or period of time. This method would be used when the designer has proprietary data that he is unwilling to sell to the Government.

E. CHARACTERISTICS OF A MODEL

1. General

The term "Model" or "Modelling" will be used repeatedly in the following chapters. "A 'model' is a simplified representation or abstraction of reality" [35:19]. It is usually simplified because reality is too complex to copy exactly and because much of the complexity is actually irrelevant to the specific problem. The purpose of a model in the business environment is to help the decision-maker predict the outcome of a specific decision before committing resources and time to implement the decision [24:84].

2. Normative Versus Descriptive Models

Normative models, sometimes referred to as analytical models, prescribe the course of action that the decision-maker should take in order to achieve goals most efficiently. Frequently, normative models rely on algorithms to determine the best alternative. An algorithm is a step-by-step process which, when completed, will lead the decision-maker to the optimal solution. Some of the most common normative models used in business are linear programming, network models, and inventory models.

Descriptive Models describe things as they are. "Their major use in management science is to investigate the outcome or consequences of various alternative courses of action" [35:24]. It is important to note that their use does not ensure that all alternatives will be examined. Therefore, unlike a normative model, a descriptive model does not seek the optimal solution but a satisfactory solution. The most common descriptive models used in business decision-making are Markov analysis, queuing models and all types of simulation models.

Due to the complexities of the Major System Acquisition environment, the relationships and interdependencies of the variables cannot be reduced to quantitative equations or steps that adequately reflect the realities of the program. Therefore, descriptive models are most often used in the acquisition environment. More specifically, simulation models are used [24:84].

3. Simulation Models

a. General

To simulate means to assume the appearance or characteristic of reality [24:84]. In terms of the general concept of modelling, this means that there are fewer simplifications of reality in simulation models than in other models. There are no built-in assumptions as is the case in most types of models. Rather simulation is a method of approaching a problem. The simulation model provides the framework within which the manager can conduct experiments to determine the outcome as various variables are manipulated. For an acquisition model to be an effective management tool, it should define the variables, the relationships and the parameters of the system.

b. Variables

Variables, when used in the simulation context, are those characteristics that are common to all programs. Variables may or may not be controlled by the program manager. There are basically three types of variables [24:87].

(1) State Variables. State Variables reflect the current state of affairs such as resources availability or technical considerations.

(2) Decision Variables. Decision Variables are used to effect a change in the state variables such as a policy change may require additional resources.

(3) Environmental Variables. These variables are usually beyond the control of the program manager but greatly impact the program.

c. Relationships

State, decision and environmental variables so relate to each other that a change in one has an effect on the other. It is the connection of these variables into an integrated system that makes a model a true model rather than an assemblage of facts. The definitization of these relationships enables a manager to manipulate the variables and determine the effect of the change.

d. Parameters

Parameters serve to "tailor" generalized variables and relationships for use on a specific program. The use of parameters allows a model to be effectively used by more than one program. A program manager utilizing the model must analyze the importance of each variable and decide which variables are applicable to his/her program. A simulation model is only useful if it permits the Program Manager to make better evaluations of the consequences of his decision before the decision is implemented [24:87].

III. LEADER/FOLLOWER

A. DEFINITION

The Leader/Follower second sourcing acquisition strategy is defined in DAR [39:4-701]:

> Leader Company procurement is an extraordinary procurement technique under which the developer or sole producer of an item or system (the leader company) furnishes manufacturing assistance and know-how or otherwise enables a follower company to become a source of supply for the item or system.

Although the above definition has appeared in the DAR (then ASPR) since 1964, the concept is neither widely understood nor recognized by the title of Leader/Follower (L/F). One of the first problems this researcher uncovered was one of definition. In the Joint Cruise Missile Project Office, the concept of L/F includes the Directed Licensing (DL) technique described in the preceding chapter. They do not distinguish between L/F and DL since both require that the designer/developer provide manufacturing assistance and know-how to the developing second source. However, a major distinction is that in utilizing a DL arrangement the designer/developer (the licensor) receives a royalty fee for a specified number of units that the licensee may produce. While in the L/F method, the designer would be paid for the time period that he gives technical assistance to the Follower. It is the opinion of this researcher that this is a valid distinction

and the methods should not be addressed as a single concept. The major reasons for this are: (1) the question of Licensor or Leader motivation to provide technical data and manufacturing know-how to the Licensee or Follower, and (2) the question of ownership of data rights. Therefore throughout this thesis the use of L/F and DL will be considered as two separate concepts.

B. LEADER/FOLLOWER DECISION

1. General

Once the decision is made to establish a second source, the Program Manager must decide which second sourcing technique would be most appropriate for his/her program and particular system or subsystem. In making this decision, the Program Manager should consider several factors including objectives of second sourcing, technical data rights, technical complexity, reprocurement data package, motivational factors, political considerations, and the extent of subcontracting.

2. Objectives

General management theory requires that the first step in the decision-making process be the definitization of the second sourcing objectives. L/F would be an appropriate method as a means of [39:4-701]:

a. assuring standardization of components and interchangeability of parts

b. assuring a source of supply

c. establishing a competitive second source

d. meeting schedule requirements which could not be achieved by one supplier

e. reducing technical risk.

3. <u>Technical Data Rights</u>

From interviews, the researcher observed that ownership of technical data rights may be the most critical factor to a Leader/Follower decision. If the Government has established clear ownership rights to the data, then this factor need not greatly concern the program manager. However if the designer claims proprietary data rights which he will not transfer to a competitor, then the program manager must closely analyze the data to ensure that in fact the contractor truly owns the rights. If the contractor does in fact own the data, then the use of L/F may not be a feasible second source methodology.

4. <u>Technical Complexity</u>

The L/F technique is designed to provide liaison and cooperation between the designer and the Follower so as to ensure successful transfer of highly complex technlogy [1:48]. Also, by introducting a second source, technical risk may be reduced because now two contractors are attempting to "productionize" a hand-designed bread boarded prototype which is one way JCMPO anticipates cost savings over a sole source production procurement. The use of L/F would be inappropriate if

the technology utilized in the system is widely known and used in the industry [34:3].

5. Reprocurement Data Package

If there is (or expected to be) a reprocurement package sufficiently complete to allow a second source to effectively produce the system, then the more traditional secound sourcing technique of TDP should be considered [34:9]. However, one of the benefits designed into L/F is to bring a second source on line before a complete technical data package is available to the Government. In addition, under the L/F arrangement, the Leader is responsible for the technical data transferred to the Follower rather than the Government assuming the responsibility for the accuracy and completeness of the specifications [21:347].

6. Motivational Factors

one very distinct drawback to L/F is the natural reluctance of the Leader to educate a competitor. Currently, DAR states that conditions for use (underlining added) [39:4-702]:

> (a) the company possesses the necessary production know-how and is able to furnish requisite assistance to the follower.

A proposed revision to this section of DAR reads [7:4-702.2]:

> (1) the leader company possesses the requisite production know-how and is willing to furnish the necessary assistance and technical data to the follower.

The change from "able" to "willing" undersocres the need of the Program Manager to consider motivational issues.

Therefore, the program manager considering the use of L/F should plan to motivate the Leader, first, to accept L/F as a second sourcing technique, and second, to motivate him to implement L/F in a timely manner [3:2].

The necessity of motivating the Leader to accept L/F is closely tied to the timing of the L/F decision. If the decision to second source using L/F is made in the early developmental phases of the program, then the program manager can capitalize on the design competition by making a priced out Leader/Follower option part of the source selection criteria. This may also alleviate any problems that may arise over technical data rights. Under the threat of non-selection, the Leader would be required to prepare a Technology Transfer Plan (TTP) which could be incorporated into the initial production contract if the option is exercised [13].

However, the decision to implement L/F is not always made before design selection. If this is the case, claims of proprietary data will most likely impede L/F implementation. To overcome this problem, the program manager might seriously consider the development of an alternate design. This would be a feasible approach if funding requirements for design efforts by the second source is not considerable and standardization is not a driving objective in the second sourcing technique selection. If the designer perceives that the Government is serious, he will most likely opt for L/F or DL depending on the validity of proprietary data rights claims [16].

The threat to develop an alternate source may work for subsystems or components. However, if the Government wishes to establish a second source "prime" contract, then this tact may not be feasible, as the cost to produce and operate two separate designs maybe prohibitive [2:369].

Another avenue the program manager may consider is guaranteeing the designer a specific percentage of the yearly Production buy. However, this tact may reduce the competitive potential of L/F if the quantity guaranteed is greater than the Leader's minimum sustaining rate [19].

7. Political Considerations

The interest of Congress in major systems acquisition is a reality and a major consideration for every program manager. The notification of award of any contract over $1,000,000 must be withheld pending notification to Congress. Therefore, contracts involving millions and perhaps billions are of keen interest to Congress for this means considerable Federal monies and resources are directed to the state of the selected contractor.

In general, Congress favors competition as revealed in the following dialogue between Senators Proxmire and Chiles [23:12]:

> Senator Proxmire: We need competition early, we need it late. We need it at all points in a procurement process, more competition than we have now. ...If you do not get that competition in early, you are missing, I think, the principal value of competition.
>
> Senator Chiles: I agree that we should be getting more competition.

However, the fulfillment of constituency desires ensures a Congressman's re-election. A cynical observer translated this to mean, "Competition is great except for a contractor located in my state."

Therefore the make up of the House and Senate Armed Services Committees and the House and Senate Appropriation Committees should be closely analyzed by the program manager as the "Power of the Purse" can kill required second sourcing funding. Senior members of these committees wield considerable power not only in the committee itself but on the floor of Congress as well. Congressmen not on these committees do not have the time to adequately research each funding legislation and they take their voting cues from members on these committees unless constituency interest dictates personal involvement. A program manager who wishes to overcome this Congressional tendency must be able to present a strong case for the benefits of second sourcing such as projected cost savings or deployment schedules which require a second source in order to be achieved [32:44].

8. Extent of Subcontracting

From interviews with JCMPO personnel, this researcher observed that if the decision to second source a system or subsystem is made prior to design selection, the extent of subcontracting utilized by the designer should be considered prior to implementing L/F. If a major portion of the system or subsystem is subcontracted, then requiring the designer

to establish dual subcontracting sources may be the most cost effective way to achieve the intended L/F objectives. The critical decision criteria would be that additional projected cost savings exceed the cost of implementing L/F.

C. LEADER/FOLLOWER IMPLEMENTATION

1. Procedures

DAR suggests three methods for establishing a Leader/ Follower contractural relationship [7:4-702.2]:

> (1) Award of a prime contract for supplier to an established source (leader) with the obligation to subcontract a designated portion of the requirement to a specified or competitively selected subcontractor (follower) and to assist the follower company with that production quantity (the educational buy).
>
> (2) Award of a prime contract for supplies to the leader company with the obligation to assist the follower, also under direct contract with the Government for furnishing of the required equipment.
>
> (3) Award of a prime contract to the follower company with the obligation to award a subcontract to the leader firm, for the assistance required to bring the follower into production.

The actual procedure the program manager selects will depend on the driving objectives for establishing L/F. In analyzing the three procedures, the researcher observed that all three relationships encourage commonality of design. However, procedures 2 and 3 appear to reduce the dependency of the Follower on the Leader and are more appropriate where the primary objective is assurance of supply or maintenance of the mobilization base. Under these arrangements, one interviewee suggested that the Leader does not see the

Follower as the usurper of his business but rather "another cost of doing business with the Government." Cooperation rather than competition is encouraged. However, commonality may suffer because the Leader is not responsible for qualifying the Follower and the Government is the primary coordinator. Procedures 2 and 3, also, appear to be more appropriate where the Government is actively involved in the design of the system as is the case in the shipbuilding industry [16].

2. <u>Technology Transfer Planning</u>

JCMPO personnel felt that the first step to successful L/F implementation is the establishment of a definitive technology transfer schedule. The schedule should not only specify the required date for Follower qualification but also intermediate milestones so all parties concerned may judge the progress of the technology transfer.

JCMPO experience, also, indicated that the Technology Transfer Plan (TTP) should address configuration management. Required turn-around times should be specified. Configuration Management is usually the responsibility of the Leader even after the completion of the Leader/Follower educational phase. However the Follower should be a part of the configuration management board in order to facilitate communication.

The TTP should also address testing requirements that the Leader will perform for the Follower, if any. As with the configuration management, the plan should specify turn-around times.

3. Motivational Considerations

In order to ensure that the Leader maintains the technology transfer schedule, the program manager should consider the use of both positive and negative incentives. Positive motivational factors might be:

a. Establish a contractural award fee relationship which incentives the Leader management of the Follower. Possible award fee consideration could be (1) Follower milestone accomplishments, (2) quality of Follower's product, (3) timely delivery, and (4) Follower's cost [16].

b. Base the Leader's portion of the first year's fully competitive buy on his performance during the Technology Transfer phase [16].

Negative motivational factors might be:

a. Tying progress payments to Leader/Follower milestone accomplishments [34:17].

b. Require that the Leader meet the Follower's delivery schedule. However, the Leader would not be paid for these units until the Follower delivers [17:6].

c. Bad publicity due to a low award fee [16].

The program manager should consider the use of a combination of both positive and negative motivators. The use of positive factors alone will probably not achieve the desired performance because the Leader's competitive position will be further enhanced the longer it takes to qualify the Follower.

In order to ensure that all parties concerned understand their duties and responsibilities, a Memorandum of Agreement (MOA) should be prepared by the Government which spells out the technology transfer schedule and the motivational factors. This document would be signed by the Government, the Leader and the Follower before contract award.

4. Follower Selection

DAR requires that the Government retain the right to approve the Follower as a condition for use [39:4-702]. The Government may reserve the right to designate the Follower or may require that the Leader competitively select the Follower. If Full-Scale Engineering Competition has been maintained through the design phase, the Government may designate the "loser" of the design competition as the Follower. This approach has a distinct advantage from the Government's viewpoint because the "loser" understands the performance requirements and if the two designs are similar, the learning is more pronounced. Therefore, the Follower (the "loser") would most likely be "educated faster" than a contractor who was totally unfamiliar with the project, thus bringing the competitor (the Follower) "on line" sooner. However, for a competitor to become the Follower may not be practical. This will depend on the "loser's" desire to stay in the program.

A proposed change to this section of DAR reads: "(2) the Government retains the right to approve the evaluation factors used to select the Follower company." [7:4-702.2(c)]

Thus, removing the requirement for the Government to approve the actual selection of the Follower. Selection criteria may include [13:3-5]:

a. Technical Proposal -- the proposal should adequately convey an understanding of the Developer's design and should identify high rish areas.

b. Past Experience -- it would be beneficial if the proposed Follower has experience on similar programs both as a prime and subcontractor. One industry interviewee stated that subcontractor experience should be carefully analyzed because the ability to build to another company's drawings will be essential to successful L/F implementation.

c. Program Management structure -- the program management plan should adequately address L/F interface considerations. Implementation of cost/schedule control criteria should also be addressed.

d. Financial Consideration -- the cost of the Leader/ Follower implementation should be realistically priced.

However, one Government interviewee stated that the Government should be actively involved in the selection of the Follower and not just a "reviewer" of the selection criteria because, if competition is the ultimate goal, the Leader will, most likely select a Follower who is either technically "weak" or sees himself as a subcontractor to the Leader. In either case, the technology transfer will be slowed down and the Leader's competitive position will be enhanced because he

will "continue down the learning curve" as the Follower falls behind. If the Follower is "technically weak" it will take longer to "educate" him. On the other hand, if the Follower sees himself as a subcontractor then he will wait for the Leader's direction which will, most likely, be slow in coming, thus "stretching out" the technology transfer phase.

The decision as to whether the Government or the Leader selects the Follower appears to be dependent on three factors: (1) the Government's contractual relationship with the Leader, (2) the resources of the project office, and (3) Leader/Follower compatibility. If the Leader is a subcontractor to the Government's prime contractor, then the prime contractor is contractually obligated to select or oversee the selection of the Follower. The Government does retain the right to approve all subcontracts [20:7-700]. On the other hand, the Government can direct the prime to subcontract with a specified firm as part of its contractual obligations but the Government hesitates to use this option because of the other two factors.

It takes considerable resources on the part of the Government's project office to draft the Request for Proposals (RFP) and the selection criteria. It would take less time and effort to review the Leader's proposal and selection criteria. However, the Government does risk the possibility that this "reviewing" will not adequately ensure that the Leader's RFP and selection criteria are detailed enough to permit the

potential Follower to "intelligently" submit technical and cost proposals.

Another consideration is Leader/Follower compabibility. If the Leader selects the Follower, it is hoped that they will work well together. However, this objective may encourage the Leader and Follower, as one industry interviewee inferred, to come to some kind of agreement that will ensure that neither contractor will "take over" the program by "low-balling" the L/F competitive procurements. The Government can counter this by guaranteeing the minimum sustaining rate to each. On the other hand, the Government should include a clause which states the Government may make a sole source award if one ". . . entity is not acceptable based upon performance or price. . ."[17:8].

The possibility of low-balling is present regardless of who selects the Follower. The best defense against it is ensuring that both companies submit realistic prices.

5. Government's Relationship with Leader and Follower

The Government may assume a "reviewer's" role or take an active aggressive role to ensure L/F compliance. If the reviewer role is assumed, then the current traditional contract administrative procedures would be deemed adequate with the appropriate Defense Contract Administration Services (DCAS) Office assuming the responsibility for overseeing the L/F implementation [3].

However, if an active role is assumed, then the program manager would assign a member of his staff to oversee

implementation. Both the Leader and Follower would report L/F implementation problems to him if they can't be solved in a timely manner at the local level [3].

6. Feedback Considerations

To ensure that L/F implementation is proceeding in a timely manner, management theory dictates that feedback systems should be established. The use of cost performance reports required by the C/SCSC is one way to monitor performance. However, these reports are only good if definitive milestones are established and the progress reported is in fact progress made. The Government should closely monitor the L/F reporting elements.

Another monitoring device suggested by JCMPO personnel would be the requirement that L/F progress be reported at program reviews. This would be most effective in Joint Leader/Follower Program reviews where the program managers for the Government, the Leader and the Follower could discuss imple-ntation problems and the means to correct them. This tact would also provide positive feedback for successes in implementation. The elevation of L/F considerations to the program manager level should have a positive effect on implementation.

IV. THOMPSON-RUBENSTEIN LEADER/FOLLOWER MODEL

A. GENERAL

DOD Instruction 5000.1 "Major System Acquisition" states [37:c]:

> Each DOD official who has direct or indirect responsibility for the acquisition shall be guided by the objectives of OMB Circular A-109 . . . and shall make every effort to:
>
> 1. Ensure that an effective and efficient acquisition strategy is developed and tailored for each system acquisition program.

In order to assist the program manager to develop his second sourcing strategy, the Air Force Business Research Management Center, Air Force Systems Command sponsored a study to develop a Leader/Follower (L/F) Decision Model. Charles W.N. Thompson and Albert H. Rubenstein of International Applied Science and Technology Associates, Inc. (IASTA) presented a L/F model in their final report [34:12-18]. The Thompson-Rubenstein Leader/Follower (T-R L/F) Model is presented in Appendix B of this thesis. Section B of this Chapter will describe the salient characteristics of the model as presented on pages 12 through 18 of the final report. Section C of this Chapter will describe other factors that the final report discussed but were not included in the Model.

B. CHARACTERISTICS OF THE MODEL

1. General

The T-R L/F Model is a descriptive model which identifies the factors (variables) associated with two decisions: ". . .(a) whether or not to use (or consider using) Leader/Follower; and (b) how to use it"[34:12]. The model requires that a "preliminary analysis" be conducted to determine if L/F is feasible and whether a more "detailed analysis" is warranted. Once the decision to second source using L/F is made, the Model addresses "how to use the L/F methodology."

2. The Preliminary Analysis

The preliminary analysis consists of two parts. The first part involves examining three factors: (1) program objectives, (2) the characteristics of the procurement, and (3) time. These factors are examined to determine if second sourcing is desireable.

> . . . While there may be several objectives [for second sourcing] the most likely ones are achievement of some advantage in the cost (of the production buy and assurance of supply). These objectives are, in turn, sensitive to the second factor, the characteristics of the procurement, and particularly the size and the schedule. The third factor, time, enters in at least two ways: First, whether this decision is being considered early enough to allow introduction consistent with the time needed. There are other factors which may affect this decision, the most important of which is probably in the form of strong policy guidance [34:8].

Although the T-R L/F model structure does not specifically address the visibility of the program, the

final report which presents the model does address this program characteristic stating [34:8].

> Visibility of the program may serve to facilitate (or impede) the effective use of leader/follower, depending upon the nature of the support of the procuring agency.

If the program is highly visible then the use of L/F may be "evaluated" prior to its completion and the Program Manager may lose some of his/her flexibility in L/F implementation [34:B-6].

The final report also discusses program stability in terms of projecting cost savings. If the quantities to be procured or the duration of the program is uncertain, then it may be difficult to

> . . . estimate potential cost savings (the differnce between cost of establishing a second source and the cost advantage of competitive production procurement or to introduce leader/follower early enough to meet schedules [34:B-6].

The second part of the Model's preliminary analysis is the Leader/Follower decision. This analysis requries the examination of three additional factors: (a) commonality, (b) the reprocurement data base, and (c) the willingness and ability of the Leader and Follower (characteristics of (potential) contractors).

a. commonality is an assumed objective if Leader/Follower is being considered.

b. Reprocurement Data Package, the second factor, ". . . is probably the most critical determinant of the

feasibility and/or desirability of leader/follower" [34:14]. If a "complete" package is available then L/F is not necessary. On the other hand, if the package is so incomplete or the technology so innovative, the L/F may not be feasible. "Only in the 'middle area' where the second source can (only) be put in a position to produce and/or compete through 'extraordinary assistance' is leader/follower indicated" [34:15].

Appendix B of the final report also discusses the question of rights in data [34:B-8].

> Where the TDP does include (or would be required to include to be complete) proprietary data (or know-how), provisions for assistance (as required by leader/follower) will need to include not only recompense for the time and effort but also for the value of the proprietary information provided. This is, conventionally, a matter of licensing which may be considered either an alternate to or an alternative form of leader/follower.

c. The characteristics of (potential) contractors, the third factor. ". . . apparently presents few initial problems in considering whether to use leader/follower . . ." [34:B-10].

The technical capabilities required for the Leader and Follower are not significantly different from those required by "non-leader procurements.: In the discussion concerning potential contractor characteristics, the final report states [34:B-11]:

> While it is difficult to speak with confidence, based upon a small sample and a limited interchange, it appears to be the general impression of contractor program personnel that leader/follower, where

introduced, is just another cost of doing business, just another condition imposed by the customer to meet some important or other need. During the early stages there appeared to be few if any noticeable specific efforts upon the leader other than anticipation of possible difficulties in transfer and loss of production volume.

3. Detailed Analysis

If the "preliminary analysis" indicates L/F is a feasible approach, then a detailed analysis is necessary. The detailed analysis consists, primarily, of examining cost and availability (assurance of supply).

"The achievement of savings in the cost of the production quantities requires, essentially, a comparison of cost of sole source with cost of second . . . sourcing" [34:15]. The cost of second sourcing to the Government are administrative costs; cost of services provided by the Leader to the Follower, and start-up costs for the second source [27:15]. Potential cost savings due to competition should pay for these costs to the Government if the objective of L/F is "cost savings." "For programs with very large quantities and extended production runs it is more likely that cost savings will be realized" [34:15].

The availability (or assurance of supply) is the second factor to be considered in the "Detailed Analysis." If the quantities required by the Government due to deployment schedules exceed the capacity of one contractor, then second sourcing may be dictated regardless of cost. Other "assurance of supply" factors to consider are [34:16]:

> . . . the facility 'vulnerable' to environmental assault or local labor conditions; is the producer capable of building up and maintaining the desired production rate; is management stable and responsible.

4. How to Use Leader/Follower

If the Preliminary and Detailed Analyses indicate L/F is feasible, then the model moves the user to the "How to Use" section. The Model presents three major "How to Use" factors: (a) Timing, (b) Form, and (c) Incentives.

The first factor, Timing, ". . . may affect the use of Leader/Follower in several ways." The timing scenario presented is concerned with "time-available" and "time-needed" to accomplish the Leader's education of the Follower. The "time-needed" to educate the Follower may be greater than the "time-available" to be cost effective or to meet delivery schedules. Early planning would help alleviate this problem [34:B-8].

The second factor, Form, describes the three contractual relations suggested in the DAR [39:4-702]. The three contracting methods are [34:17]:

> . . . through a subcontract from the leader to the follower, through separate prime contracts (with a contractual provision requiring the leader to provice assistance) or even a subcontract from the follower to the leader for assistance.

The third factor, Incentives, are directed to assure ". . . that the leader provides the requisite manufacturing assistance and know-how and that the follower accepts it" [34:17]. A suggested incentive is to tie progress payments to successful L/F implementation.

The characteristics of this Model can be summarized by reviewing the flow chart presented in Appendix B of this thesis. The three major phases of the T-R L/F Model are: (1) the Second Sourcing Decision, (2) the Leader/Follower Decision and (3) Leader/Follower Implementation. All of the factors described in the first phase overlap into the second phase and will affect the L/F implementation.

C. OTHER FACTORS

1. General

The final report discussed two characteristics which were not directly or indirectly included in the Model. They are: (1) the characteristics of Procuring Agency, and (2) the relation between Government and contractors. It is the opinion of this researcher that these characteristics are important to L/F implementation and therefore should be discussed.

2. Characteristics of Procuring Agency

This characteristic discusses the lack of Government personnel experience in the L/F methodology. The agency personnel interviewed by Dr. Thompson felt that the objectives of second sourcing and various means of 'encouraging' the designer to assist the follower is part of any experienced contract administrator's background and L/F would not present additional problems. Government personnel also indicated that the introduction of a second source increased management problems for the agency. "Program managers are inclined to

favor a single point of responsibility, preferring, . . . that the systems contractor worry about all of the technical, cost, and scheduling problems" [34:B-14].

3. Relation Between Government and Contractors

"Where the prospective leader company has already established its capability . . . [to] produce, the government may find its options limited" [34:B-15]. If the contractor has developed a proprietary position, then the Government may have to negotiate a licensing agreement. However, if the system is in the design/development stage and two or more contractors are competing for design selection, then a L/F option may be included in the design selection Request for Proposal (RFP) [34:B-16].

V. THE JOINT CRUISE MISSILE PROJECT OFFICE

A. LEADER/FOLLOWER ACQUISITIONS AND PROJECT HISTORY

This Chapter discusses four acquisitions managed by the Joint Cruise Missile Project Office (JCMPO): the Cruise engine, the Reference Measuring Unit and Computer/Inertial Navigation Element (RMUC/INE), the Air Launched Cruise Missile (ALCM), and the Digital Scene Matching Area Correlation System (DSMAC). These acquisitions were selected for research because Leader/Follower (L/F) was used or considered for use as the second sourcing technique.

The Joint Cruise Missile Project is an outgrowth of Navy and Air Force cruise missile efforts. In the early 1970s, the Air Force initiated the Subsonic Cruise Armed Decoy Program (SCAD) for the development of a medium range cruise missile for use as a decoy. The prime contractor was The Boeing Aerospace Company (BAC).

In 1972, the Sea Launched Cruise Missile (SLCM) was established when the Chief of Naval Operations (CNO) directed that the existing long-range strategic and tactical cruise missile efforts be combined and redirected to build and test a prototype cruise missile that would fit into a submarine torpedo tube envelope. Competitive development contracts were awarded to General Dynamics (GD), Convair Division and LTV, Vought. The Navy selected the GD design for Full-Scale Engineering Development (FSED) in March, 1976.

In 1975, the Under Secretary of Defense (Research and Engineering) (then known as Director of Defense Research and Engineering (DDR&E)) directed the Navy and Air Force to restructure their cruise missile programs to meet parallel milestones and to maximize commonality of the warhead, guidance, and propulsion systems. During this timeframe, the Navy exercised an option to modify the GD SLCM design for ground and surface ship launch capability.

B. POLICY STATEMENTS

By 1977, three distinct cruise missile projects were under development: Air Launched Cruise Missile (ALCM), Surface and Submarine Launched Cruise Missile (SLCM) and Ground Launched Cruise Missile (GLCM). In September 1977, the Under Secretary of Defense (Research and Engineering) directed that a co-located joint office be established to manage the three cruise missiles. He stated [41]:

> It is a matter of highest national priority, especially in the light of the B-1 decision, to develop an air launched cruise missile (ALCM) with optimum performance and minimum cost and schedule delays. I believe we can best accomplish those program objectives by conducting a competitive fly-off between Boeing and General Dynamics to determine which of their missiles will be the ALCM to be flown on the B-52 . . . . During the course of the competition we want to continue to emphasize the component commonality between these two missiles and with the SLCM and GLCM.

He further stated that the newly established Joint Cruise Missile Project Office (JCMPO) would receive programmatic and

fiscal direction from an Executive Committee (EXCOM). The EXCOM members are:

1. Under Secretary of Defense for Research and Engineering (Chairman).

2. The Assistant Secretary of the Navy (Research, Engineering and Systems)(ASN(RE&S)).

3. The Assistant Secretary of the Air Force (Research, Development and Logistics) (ASAF(RD&L)).

4. The Vice Chief of Naval Operations (VCNO).

5. The Vice Chief of Staff Air Force

6. The Assistant Secretary of Defense (Program Analysis and Evaluation) (ASD(PA&E)).

7. The Assistant Secretary of Defense (Comptroller) (ASD(C)).

The Charter for the Joint Cruise Missile Project charges the project manager to:

> 1. . . . maximize subsystem/component and software commonality and quantity buy, to utilize fully joint test and evaluation, to encourage subsystem/second source competitive procurement, and to otherwise derive maximum benefits from the management of several cruise missile projects for the successful management and accomplishment of the project objectives. He has broad authority and responsibility as specified in DODD 5000.1 for planning direction, control and utilization of assigned resources of the approved program to meet Navy and Air Force requirement [43:3a].
>
> 2. Develop and tailor an acquisition strategy for the total program. The strategy shall be directed to program execution and then achievement of program objectives in an economical, effective and efficient manner. Technical, business, and management areas shall be addressed in the strategy to provide a basis for the integration of these areas in achieving the program objectives. The strategy shall be expanded and refined as the program progresses and provide the basis for direction of the program and for assessment of program successes in achieving the established goals and objectives . . . [43:3c(6)]

3. Direct a procurement program that includes maximum use of effective competition for achieving objectives through the system acquisition process [43:3c(7)].

The Honorable William J. Perry, Chairman, EXCOM, stated before the 95th Congress House Senate Joint Committee on 14 April 1978 [27]:

> Dr. Perry: We made two management judgments in the course of this program that are of more than usual significance. We have concluded that we should maintain competition during the production phase, and we are exploring a Leader/Follower arrangement as a management way of achieving this . . . . The main reason for the competition, the main programmatic reason as I see it, is to maintain the competitive environment on the theory that we'll get better designs and better cost performance if we maintain the competition.

In a memorandum for the President, the Secretary of Defense stated,: " I recommend that you approve the Cruise Missile Program as a program of highest national priority" [40]. The President approved the Secretary's recommendation.

With Executive and Legislative support, the Program Manager, Rear Admiral Walter M. Locke, developed an Acquisition Strategy which included both design and production competition. The next sections of this Chapter will discuss the planning and implementation of the four second sourcing acquisition strategies where Leader/Follower was used or considered for use.

C. THE CRUISE MISSILE ENGINE SECOND SOURCING STRATEGY

1. Second Sourcing Decision

Prior to discussing the Engine acquisition, it should be pointed out that the second sourcing technique utilized by the Project Office was Directed Licensing (DL). However, this researcher included the Engine acquisition in the study because Leader/Follower (L/F) was considered for use and the problems encountered during the technology transfer phase of the contract are similar to problems a program manager might encounter in attempting to implement L/F.

In light of the stated policy, the possibility of second sourcing the cruise missile engine was first explored in late 1977. Williams Research Corporation (WRC) had designed and developed the F-107 engine which was to be used by all versions of the cruise missile. The objectives for second sourcing were [20:16]:

a. Capacity

WRC did not have the capacity to produce the required engines to meet the cruise missile deployment schedule. However WRC assured JCMPO that capacity could easily be expanded so as to meet the required delivery schedule.

b. Cost Containment

With the introduction of a second source, JCMPO hoped to realize the benefits of competition to reduce or contain costs by avoiding a monopoly during production.

c. Risk

A second source would reduce the risk of non-delivery. If one company failed to meet delivery requirements, for technical or economic reasons, the other company would be capable of expanding its production capabilities to meet required delivery dates. One Government interviewee also stated that second sourcing reduced risk in that contractors in a competitive environment, were more responsive to the "needs of the customer" and thereby more easily managed.

JCMPO told Williams (WRC) it was the Government's desire to establish a second source for the engine. WRC informed the Government that they had proprietary rights to the technical data and did not wish to sell these rights or consider a Leader/Follower Second Sourcing arrangement. The Government questioned the extent of proprietary data claimed by WRC but knew that the determination of rights in technical data and computer software would require extended investigation which could take several years.

Therefore, the Project Office explored the possibility of developing an interchangeable engine (Form, Fit, and Function) and on 17 November 1977 the EXCOM for The Joint Curise Missile Project Office (JCMPO) approved the development of the Alternate Cruise Engine (ACE).

On 10 February 1978, a JCMPO notice was published in the Commerce Business Daily requesting that an engine producer capable of developing an alternate cruise engine

contact the Project Officer [20:14]. JCMPO intended to release a competitive Request for Proposals (RFP) by 31 March 1978. However, Williams proposed that they competitively select a licensee with Government approval, to be the second source supplier. The decision to continue with the ACE development was reduced to three issues: Risk, Schedule, and Cost. A JCMPO second sourcing briefing stated [16]:

> Risk - [The] main difference between alternatives is technical risk.
>
> -- ACE would reduce technical risks associated with design problems.
>
> -- WRC License would reduce technical risks associated with production problems.
>
> -- [There is] no reason to believe WRC engine has inherent design problems. [However], there is concern regarding production.
>
> Schedule - estimated date for achieving production capacity.
>
> WRC Licensee - January 1982.
>
> ACE - January 1984.

One interviewee estimated that it would cost an additional $30 million to develop the alternate engine (ACE) if the Government refused the Williams licensing approach. In light of risks, schedule and costs, JCMPO deferred the ACE development program and licensing negotiations were conducted with WRC. However, the "ACE RFP . . . should be released if problems arise in negotiation of [the] WRC contract modification" [16].

2. Engine Licensing Agreement

In August 1978, the JCMPO contracting officer and WRC signed a licensing agreement (See Appendix C). The Government agreed to the following [19]:

a. The Government will procure from the Licensee only the quantity of engines that are in excess of WRC's capacity or beyond WRC's ability to meet schedule requirements.

b. The Government shall procure the first 20 engines per month from WRC; in quantities of 21-100 per month, 25 percent is guaranteed to WRC; and for quantities greater than 100 per month, 50 percent is guaranteed to WRC.

c. The exact quantity that the Government procures from the Licensee will be determined by (1) cost/price comparison between licensor (WRC) and Licensee, (2) ability to produce on schedule, and (3) the need to maintain dual production capability in the interests of National Security.

d. The Government will pay royalties to WRC for the engines produced by the licensee. (For exact rates see Appendix C).

3. Licensee Selection

The Project Office (JCMPO) indicated the decision to have Williams (WRC) rather than the Government, select the licensee was due to two factors. The primary reason was that Williams needed to negotiate the licensing agreement. The other factor was that it would require less effort (resources) on the part of the Project Office (JCMPO) to review their selection process.

This was a consideration because the Air Launched Cruise Missile (ALCM) competitive fly-off was underway. This was consuming much of their time and by having Williams (WRC) select the licensee, JCMPO felt less effort (resources) would be required of the Project Office.

Even prior to the final agreement with JCMPO on all the terms of the licensing arrangement, WRC proceeded to conduct negotiations with prospective licensee contractors [20:16]. Williams (WRC) considered six companies in their source selection process. JCMPO personnel stated that as WRC completed a site survey with a company, a Government team would follow and conduct its won site survey several days later. At the completion of the source selection process, WRC wished to award a contract to a totally unsuitable (in the Government's viewpoint) contractor. The contractor WRC selected did not have any experience in turbojet engine designing and was in fact a diesel engine producer. The Government team, on the other hand, wanted a contractor that was totally unacceptable to WRC. By way of a compromise Teledyne CAE (TCAE) of Toledo, Ohio, was selected by WRC and approved by the Program Office.

4. Technology Transfer

In order to implement the technology transfer, Williams (WRC) was to [16]:

a. Provide "know-how" documentation which includes manufacturing drawings and techniques, tool designs, and process specifications.

b. Provide personnel to TCAE to assist in interpreting and implementing these drawings.

c. Qualify TCAE as producer by fiscal year 1982.

Government personnel described the implementation of the Technology Transfer as "at best, not an overwhelming success." Currently, Teledyne (TCAE) is about a year behind schedule and $5 million over cost. When this researcher asked how this happened, the following reasons were given.

The reason most often cited was the lack of "negative motivational factors" for Williams (WRC) to qualify Teledyne (TCAE). The licensing agreement essentially protects Williams' competitive position, however; it does not provide any reason for WRC to qualify TCAE except the threat of terminating the licensing agreement, which WRC did not want in the first place. One interviewee stated that considering cost growth and schedule slippage, the alternative cruise engine should have been developed, but this isn't a viable solution due to time constraints.

Another reason often cited by the Project Office was the failure of Teledyne (TCAE) to act as the Government would expect a prospective competitor to react. When TCAE had problems, they simply waited for Williams' guidance which was slow in coming. Instead of contacting JCMPO, Teledyne would try to work with WRC as a subcontractor with the basic philosophy, "Keep the customer happy." WRC, not the Government, was seen as the customer.

The Project Office (JCMPO) also stated that much of Teledyne's (TCAE) cost growth was due to the lack of technical information provided in the Williams (WRC) RFP. The Project Office stated they had not "adequately reviewed" the Williams RFP because of personnel and time constraints.

The next point discussed was Government surveillance. Three major deficiencies were described. Each contributed to poor visibility of Leader/Follower milestone accomplishments as prescribed by the licensing agreement and contract. The first deficiency was that the Project Office had not envisioned a coordinating problem between the various DCAS offices which turned out to be a considerable problem. Two spearate DCAS regions was handling the WRC and TCAE contracts and any one DCAS region is neither organized nor funded to provide a single manager for contract administration which would have provided visibility over the two contractors' relationship. On-site inspection of both facilities by a single manager proved to be necessary for proper coordination of L/F implementation and DCAS personnel are not funded to travel outside their regions.

The second deficiency was the failure to require Williams (WRC) and Teledyne (TCAE) to report the status of the technology transfer at program reviews. This allowed Williams to "hide" their non-participation in the Technology Transfer and, in effect, told Williams that Technology Transfer was not a major Government concern. During this timeframe, there were technical difficulties but Government personnel

interviewed indicated that Williams was "holding back" solutions to these problems; thereby, putting Teledyne further behind the learning process.

The third deficiency described was the lack of JCMPO personnel which, again, contributed to poor L/F visibility. Most of JCMPO personnel were devoted to the ALCM competitive fly-off and those assigned to the engine acquisition were responsible for technical monitoring only.

Currently, the Project Office is considering ways to motivate Williams to comply with the licensing agreement and the contract. JCMPO is taking a much more active role in technology transfer surveillance but WRC is seen "in the driver's seat" because the licensing agreement does not have any negative incentives for Williams to perform and the development of an alternate engine is not a viable consideration. However, one interviewee stated that the threat of loss of additional business may be a viable means of providing an incentive for Williams to perform because the Project Office is currently establishing a new project, the Medium Range Air to Surface Missile (MRASM). There is some controversy regarding MRASM's need and adaptation to cruise missile technology. However, procurement plans are being formulated and, at this point, the Harpoon engine rather than the cruise missile engine is being considered for use due to cost reasons and WRC's failure to qualify Teledyne (TCAE) as scheduled. If Williams wishes to reverse this planning process, considerable

improvement in TCAE's performance must be realized. If for some reason, the cruise engine were to be used for MRASM, it is doubtful that the MRASM engine requirements would be included in the licensing agreement since investigation into Williams claim of proprietary data rights has shown that a small percentage of the engine components were in fact developed by Williams at company expense.

In general, this researcher observed a negative attitude on the part of JCMPO personnel toward WRC and its business practices.

D. THE REFERENCE MEASURING UNIT AND COMPUTER/INERTIAL NAVIGATION ELEMENT SECOND SOURCING STRATEGY

1. Second Sourcing Decision

When discussing the second sourcing decision for the Reference Measuring Unit and Computer/Inertial Navigation Element (RMUC/INE) (which are parts of the Cruise Missile Guidance Set) some might classify it as Directed Licensing (DL), and other as Leader/Follower (L/F). Still, others will insist it is not second sourcing at all because eventually two Litton divisions were designated as the Leader and the Follower, thus a sole source procurement. It is the opinion of this researcher that this acquisition utilized a second sourcing strategy because the two Littion divisions did act as competitors during and after the completion of Technology Transfer. It is also Litton Corporate's policy to encourage competition between its divisions and Litton's Corporate

profit policy was suspended for this program [18:4]. In addition, this acquisition strategy might more accurately be classified as Leader/Follower because, although a licensing agreement was arranged by Litton between its two divisions, the Government was not directly involved in this negotiation. The reason for non-Government involvement was that Litton agreed that the Government would not be charged a royalty or licensing fee. In addition, Litton agreed to the following [18:3]:

> The cost for disclosure associated with the technical transfer to LSL [the designated Follower] of the ability to build the RMUC and/or INE will not be chargeable to . . . any Government contract.

Initial consideration of the Guidance Set as a candidate for second sourcing took place in early 1978 [20:22]. However, the large number of components received from a variety of suppliers meant ". . . the Guidance Set as a whole was not a practical candidate for dual sourcing at this time" [12:3]. The Project Office, in keeping with its stated second sourcing policy, requested that the prime contractor for the Guidance Set, McDonnell Douglas Astronautics Corporation (MDAC), investigate the possibility of second sourcing major components of its subsystem. The RMUC/INE produced by Litton Systems, Guidance and Control Division (GCSD) was identified as the largest and most expensive component and therefore the most likely candidate.

The objectives for second sourcing were defined by the Director of Business and Acquisition Division of the Joint Cruise Missile to be [20:26]

> . . . the reduction of risk in terms of cost,technical performance and production schedule. The establishment of dual sources for key subsystems/components has been adopted as the primary means of reducing [these] risks.

2. Technical Data Rights

Following a 1974 competition, McDonnell Douglas was one of two firms awarded a contract for the competitive development and demonstration of the Guidance Set. In May 1975, the Government issued a Request for Proposal (RFP) for a single contractor to provide the Guidance Set. This RFP required that the Government acquire unlimited rights to all data. However, McDonnell Douglas (MDAC) could not comply with this requirement because Litton GCSD refused to supply them the requisite data on the RMUC. MDAC did, however, agree to furnish all other data [20:22]. Due to the technical advantages of its system, JCMPO awarded the contract to MDAC [20:22] and, in so doing, the Government did not obtain unlimited rights to RMUC.

3. Second Sourcing Techniques Considered

Two second Sourcing techniques were considered: Form, Fit, Function and Directed Licensing [20:26]. However, Litton GCSD was not willing to license a manufacturer because it would entail making available to the multiple offerers GCSD's trade secrets and proprietary data. Therefore, the Project

Office directed McDonnell Douglas (MDAC) to issue an RFP for an alternate design, the Form, Fit, Function approach. While the RFP was on the street, Litton Corporate, Litton Systems, Inc., approached MDAC and the Government with an offer to have Litton GCSD license at "no cost to the Government or MDAC" another Litton division, Litton Systems Limited, Canada (LSL) to produce the RMUC/INE. A detailed Life Cycle Cost (LCC) analysis was conducted and this arrangement appeared to be the most advantageous to the Government in terms of cost [20:27]. In addition to LCC considerations, it was estimated that Litton GCSD would be producing approximately 60 units per month before an alternate designer would be qualified as a competitor. The technical risk was also rated much higher with an alternate design since GCSD's design was proven. Therefore, the Government agreed to accept Litton's offer which is basically a Leader/Follower strategy [19]. McDonnell Douglas cancelled the Form, Fit, Function RFP. Singer Company challenged the Government's/MDAC's rights to cancel the RFP and claimed there would be "no real price competition between the two Litton entities since both are part of the same corporation" [13:3]. The GAO upheld the Government's position stating, "We find no legal basis for an objection to the arrangement set-up by JCMPO to provide competition between Litton and Litton-Canada" [13:3].

4. The Memorandum of Agreement

The Government/MDAC and Litton positions were defined in a Memorandum of Agreement (See Appendix D). In the agreement the Government and MDAC agreed to [18]:

a. neither solict nor award any contract to another contractor for the Cruise Missile Guidance Set Elements utilizing current RMUC/INE technology.

b. pay Litton for LSL and GCSD capital expenditures if the program is cancelled prior to the expiration of ten years or if less than 4,000 units are purchased from Litton.

c. a minimum sustaining rate to be awarded to both LSL and GSCD with the FY80 production buy split 60 percent to GCSD and 40 percent to LSL. After the FY80 buy, competition would determine the split.

Litton Systems, Incorporated agreed [18]:

a. to insure that LSL and GCSD would separately price their units without corporate direction, and corporate profit policy would be suspended for this program.

b. there would be no licensing fees charged to the Government or MDAC.

c. there would be no cost to the Government or MDAC for the cost of technology transfer between GCSD and LSL.

d. that GCSD will qualify LSL prior to the Fiscal Year 80 buy.

5. Technology Transfer

The technology transfer began in October 1978 and by September, 1979, LSL had constructed three RMUC's. GCSD tested these units and qualified LSL as the RMUC/INE producer [12:3-4]. One interviewee stated that this L/F acquisition is a success because production unit prices have decreased and the benefits of competition are being realized.

When questioned why the L/F acquisition strategy worked for the RMUC/INE acquisition, major reasons cited by JCMPO personnel were as follows:

a. The decision to implement the technology transfer was a corporate strategy. Profits regardless of the receiving Division, stayed within the Litton Corporation.

b. LSL did in fact see themselves as a competitor to GCSD. If LSL felt GCSD was withholding information, they immediately contacted JCMPO for resolution of the problem.

c. The JCMPO project manager designated a single point of contact for L/F implementation within JCMPO. He communicated to both GCSD and LSL that any problems with the technology transfer would be immediately relayed to the JCMPO monitor.

E. THE AIR LAUNCHED CRUISE MISSILE SECOND SOURCING STRATEGY

1. System Description and Developmental Strategy

The Under Secretary of Defense for Research and Engineering (USDR&E) directed that the Air Force and Navy establish the Joint Cruise Missile Project Office (JCMPO) in

order to efficiently and in a timely manner develop the Air Launched Cruise Missile (ALCM) [40]. The ALCM is [43:1a]:

> . . . an unmanned self-guided subsonic air vehicle under development for internal or external carry and launch by strategic bomber and, as appropriate, other cruise missile carriers for delivering nuclear weapons against fixed land targets.

The charter for the Joint Cruise Missile Project (JCMP) directed the Program Manager to:

> a. Conduct the competitive fly-off between candidate missiles, including operational tests with Strategic Air Command crews, to determine which will be the air-launched cruise missile to be flown on the B-52 and, as appropriate, other cruise missile carriers [43:3c(1)].
>
> b. Ensure the accomplishment of program, development, production and support phases and test/demonstration programs whick are planned to maximize commonality [43:3c(3)].

Therefore, a modification was made to the Boeing Aerospace Company (BAC) contract directing that its SCAD program be altered from a medium-range to a long-range missile. A modification to the General Dynamics/Convair (GD/C) contract was also issued for the design and development of an air launched variant of their SLCM and GLCM. A competitive fly-off would determine which missile would be designated as ALCM.

2. <u>Second Sourcing Strategy Objectives</u>

At this time, JCMPO, also, conducted an ALCM second sourcing review. The objectives for second sourcing were defined to be [20:18]:

a. shortening the time for delivery,

b. achieving economy in production,

c. assuring uniformity and reliability in equipment performance,

d. eliminating problems in the use of proprietary data,

e. establishing additional sources of supply and broadening the production base, and

f. effecting transition from development to production to subsequent competitive procurement of ALCM.

A cost analysis examining various learning curve projections for planned ALCM procurements from Fiscal Years 1980 through 1985 was developed [20:18]. It was determined that, unless a second source supplier was a qualified production source by Fiscal Year 1982, he would be at such a unit price disadvantage [using learning curve projections] that he would not be able to effectively compete for the remaining production contracts [20:18]. Projected Cost Savings looked especially good if the GD/C missile was the selected ALCM design since the total quantity of the missiles to be procured included the SLCM and GLCM planned acquisitions [9].

In light of the stated objectives and the requirement to qualify a second source producer by 1982, the Leader/Follower (L/F) Second Sourcing Strategy was determined to be the most effective method to achieve these goals [20:18].

3. The Leader/Follower Strategy

On 14 June 1978, the EXCOM directed that the ALCM Fiscal Year 1980 production Request for Proposal (RFP) include two options for Leader/Follower Second Sourcing. The first option required that the "loser" of the competition be the Follower. The second option required that the "winner" competitively select a Follower. The ALCM Procurement Plan (PP) states [14:1]:

> The overall objective of the competitive FSED [Full-Scale Engineering Development] program is to conduct a development and test program of the two cruise missile systems (Boeing, Seattle, AGM-86 and GD, Convair AGM-109) with the selection of one source of the government's option, use of a leader/follower concept for production.

The RFP required that BAC and GD/C develop a Technology Transfer Plan (TTP). "The TTP will include a proposed Statement of Work covering each offerer responsibilities as a Leader and as a Follower" [13:3-5]. The "Leader Company Procurement Option" was included as part of the "Criteria for Evaluation and Source Selection." This option was listed last in the elements for evaluation with the statement, "The primary elements (areas) to be evaluated are listed below in descending order of importance" [13:3-5]. This researcher asked, "How did the Boeing and GD Technical Transfer Plans (TTP) compare?" One interviewee stated that the Boeing TTP was much more detailed that the GD/C plan. When asked why, the interviewee inferred that Boeing was interested in being the Follower if the GD/C

design was selected. At the same time, GD/C felt they would not be the Follower if the BAC design was selected since they already had won the SLCM and GLCM contracts and the BAC design was considerably different from these designs. However, the interviewee did state that both companies had submitted adequate Technology Transfer Plans and that there were no problems with proprietary data claims.

JCMPO also considered ways to ensure that the technology transfer would occur in accordance with the "winner's" TTP. Motivating incentives considered were [16]:

a. Establishing an award fee to motivate Leader's Management of the Follower.

b. Split the Fiscal Year 1982 quantity based upon the Leader Performance.

c. Withholding progress payments if Leader/Follower Implementation did not occur as scheduled.

d. Publicize a low award fee.

4. <u>The Decision Not to Implement Leader/Follower</u>

On 25 March 1980, the Secretary of the Air Force, Hans Mark announced that the Boeing Aerospace Company (BAC) had won the ALCM design fly-off. The reasons Secretary Mark cited for the decision were that the BAC guidance system was "somewhat better", the BAC aerodynamic qualities were "a little better, and there were greater prospects for lower costs and easier field maintenance with the BAC design" [1:1].

About two weeks later, JCMPO announced that the Leader/Follower options would not be exercised. This researcher questioned JCMPO personnel as to why neither of the Leader/Follower options were exercised. The major reason cited was the extent of subcontracting involved in the BAC design. Although BAC was the prime integrator of the design, approximately 80 percent of the components were subcontracted. During the Developmental Contract, BAC had qualified or were qualifying dual source subcontractors. Since dual source subcontractors had been developed, the additional anticipated cost savings from second sourcing the prime would not pay for required initial start-up costs for the second prime. The objective to broaden the production base was also judged to have been accomplished by BAC subcontracting strategy.

Several interviewees felt that the decision not to implement L/F was a political decision. They felt the BAC had effectively "lobbied" the House and Senate Armed Services Committees and the Appropriation Committees to ensure second sourcing funding would not be forthcoming. In fact, both Washington State Senators [BAC's corporate state] hold senior influencial positions on these committees. However, top JCMPO management did not confirm this allegation and felt the decision was, in fact, a rational, logical decision. It is the researcher's opinion that although the political implications were not the main reason for this decision, they may have been a consideration.

F. THE DIGITAL SCENE MATCHING AREA CORRELATION SYSTEM SECOND SOURCING STRATEGY

1. Second Sourcing Decision

The Digital Scene Matching Area Correlation (DSMAC) System was recently developed by the Naval Avionics Center, (NAC) Indianapolis, In. The purpose of DSMAC is to provide greater accuracy than the current guidance system. This is particularly important for the accuracy required for non-nuclear cruise missiles. McDonnell Douglas Astronautics Company (MDAC) has been ". . . contractually assigned guidance responsibilities for [the] conventional tactical (non-nuclear) land attack cruise missile". . . . [15:1]. The production of DSMAC would be assigned to MDAC. However, in keeping with their second sourcing policy, JCMPO decided that prior to modifying the MDAC contract to produce DSMAC, they would require MDAC to accept a Leader/Follower Second Sourcing Strategy.

2. Memorandum of Agreement

In June, 1980, a Memorandum of Agreement was negotiated between JCMPO, MDAC and NAC which required Leader/Follower implementation (see Appendix E). In accordance with the MOA, MDAC agreed to [17]:

a. Prepare a RFP package for suitable contractors to prepare offers as Followers on the DSMAC production and competitively select the Follower with Government approval.

b. Qualify the second source within 16 months after selection of a Follower.

The MOA also spelled out remedies that the Government may impose on MDAC if the second source is not qualified on schedule through MDAC neglect. The following provision shall apply if the second source fails to deliver or make progress [17:6]:

> 1. MDAC shall supply additional DSMAC units to make up the second source shortfall, within four months of their scheduled delivery dates . . .
>
> 2. The government shall not be required to pay for these additional MDAC supplied units until such time as the second source is qualified . . .
>
> 3. These units shall not increase the total buy from MDAC, but shall only constitute a cost free loan of units until such time as the second source is qualified.
>
> 4. At the sole discretion of JCMP, the right is reserved to refuse to accept production units from the second source until that source is qualified . . .

When this researcher asked why MDAC would accept such terms, the interviewee stated that the Government not only owned the data rights to DSMAC but actually possessed the data and MDAC wants production rights to DSMAC. Even though this acquisition is in the planning stages, JCMPO is confident that this Leader/Follower Procurement will be a success with close Government surveillance.

G. SUMMARY

In reviewing the four acquisitions, this researcher observed that second sourcing could be analyzed in three distinct phases: (1) the Second Sourcing Decision, (2) the evaluation of Second Sourcing alternatives, and (3) Second Sourcing implementation. The key criteria for determining

if second sourcing was viable were: (1) the objectives of cost savings and assurance of supply, and (2) the quantity of units to be procured and the duration of the program.

In evaluating the various second sourcing alternatives three major factors were considered: (1) the commonality objective, (2) the ownership of technical data and, (3) the time it would take to qualify a second source. In general, commonality was a desired objective for all the acquisitions. It was determined that, in each case, there was not enough time to wait for a stabilized design package, therefore the Technical Data Package Second Sourcing approach was not a viable solution because the designer would be "too far down the learning curve"to permit the Second Source to be a viable competitor. This reduced the second sourcing alternatives to Directed Licensing or Leader/Follower. The Government had not acquired the technical data rights in two of the acquisitions and in both cases the designers refused to consider Leader/Follower or Directed Licensing. Then the Government determined that commonality was not a driving objective and proceeded with a Form, Fit, and Function approach. In both cases, the designer then proposed a Directed Licensing or modified Leader/Follower approach which was accepted by the Government because the projected cost to design and operate two separate systems was more than the cost to operate a single system.

In order to achieve successful implementation the critical factors appeared to be: (1) Follower selection, (2) Motivational factors, and (3) the monitoring of L/F milestones.

The next Chapter of this thesis applies the Thompson-Rubenstein Leader/Follower (T-R L/F) Model and evaluates whether the Model accurately points out the key decision points and implementation factors.

VI. THE APPLICATION OF THE THOMPSON-RUBENSTEIN LEADER/FOLLOWER MODEL TO THE JOINT CRUISE MISSILE PROJECT OFFICE ACQUISITIONS

A. GENERAL

This Chapter discusses the application of Thompson-Rubenstein Leader/Follower (T-R L/F) Model to the JCMPO acquisitions described in Chapter V of this thesis. The next section of this Chapter is organized to match the decision steps of the T-R L/F Model. The steps are: (1) the Preliminary analysis, (2) Detailed Analysis, and (3) How to Use Leader/Follower. The strong points and deficiencies of the Model will be pointed out as each variable is discussed in the decision-making process. Throughout this Chapter the researcher will refer to the T-R L/R Model and the final report. The distinction being made is that the final report, which contains the Model, discusses other factors which are not directly referred to in the Model. Section C summarizes the researcher findings discussed in Section B of this Chapter.

B. THE APPLICATION OF THE MODEL

1. Preliminary Analysis

a. The Objectives of Second Sourcing

The first step in the Model requires that the Program Manager formulate his/her second sourcing objectives. In all of the JCMPO acquisitions the primary objectives were

cost containment/savings and assurance of supply. The Model states these are appropriate objectives for second sourcing using the Leader/Follower technique. These objectives were also supported by "strong policy guidance" [34:14]. This policy was issued by the JCMPO and EXCOM; and was in theory, supported by the Legislative Branch.

Although not a primary objective, an anticipated benefit of second sourcing for the JCMPO was increased "contractor responsiveness" to program goals and redirection; thereby, making program management an easier task. This phenomenon can be supported by the Williams Research Corporation (WRC) and Litton Systems, Inc. agreement to license their designs when threatened with alternate design development. JCMPO personnel also pointed out that General Dynamics/Convair (GD/C) was "very responsive" to ALCM redirection during the fly-off competition, however the SLCM and GLCM project personnel found GD/C to be less than cooperative and responsive to their needs because GD/C had already won the design competition for these projects. The Thompson-Rubenstein final report implied that dual contract management would present additional problems [34:B]; however, JCMPO experience shows that competition made project management an easier task.

b. The Characteristics of the Procurement

In determining the feasibility of second sourcing, the Model requires that the size of the procurement, and the stability of the program be examined. The JCMPO, having been

designated a high priority strategic program, meet the Model's criteria for second sourcing because it is not likely that this program will be cancelled and because the quantities required are sufficient to anticipate cost savings from the introduction of effective competition.

Another characteristic, technical complexity, is discussed in an appendix of the final report. Cruise Missile technology was judged to be not so complex nor so common that the possibility of second sourcing using Leader/Follower was ruled out. JCMPO experiences have shown this to be true.

The divisibility of the program (which this researcher defines to mean the "extent of subcontracting"), is discussed in the final report but not in the Model. The extent of subcontracting was the deciding factor in the ALCM and the Guidance Set second sourcing decisions. In both cases, the extent of subcontracting proved to be the reason why L/F was not implemented. However, JCMPO required that the "prime" develop second source subcontractors for critical, high cost components and subcomponents. Due to the fact that two major L/F decisions were based on this factor, it is a finding of this researcher that this factor should be directly addressed in the Model.

c. Time or Timing

The T-R L/F Model stresses the timing factor in terms of the "time needed" to qualify a second source. In all

of the JCMPO procurements this factor was considered, and schedules were formed so that the second source could be a viable competitor for out-year production contracts. This was the major consideration in determining that the Technical Data Package second sourcing approach would not be appropriate for JCMPO acquisitions if the second source was to be a viable "competitor" for out-year production contracts.

d. Commonality

If, after reviewing the above cited factors, second sourcing appears viable, then the T-R L/F Model examines the possibility of using the L/F technique. The first factor discussed is commonality. In all of the JCMPO procurements, commonality was a desired objective. However, only in the ALCM second sourcing strategy was this a driving objective due to the high cost of producing and maintaining two designs. Form, Fit, and Function was a viable alternative to L/F in the remaining acquisitions; however, it was determined that it was more cost advantageous to support only one design.

e. Reprocurement Data Base

The Model discusses this factor in terms of "availability" and "completeness." In all of the JCMPO acquisitions a complete data package was not available to the Government for a TDP second sourcing strategy; nor would it be available in "time" to qualify a second source to be an effective "competitor." Therefore, L/F or DL are the only alternatives available if commonality is a desired objective.

The final report briefly discusses technical data rights; however, it is a finding of this researcher that ownership of technical data rights is a major factor in a Leader/Follower second sourcing decision. In the engine acquisition, the decision to second source was made after WRC had basically completed the design of the engine. WRC claimed proprietary data rights and therefore would only consider a licensing arrangement. Subsequent investigation has shown that WRC did not have the rights claimed but JCMPO did not have the "time" to investigate these claims prior to starting the education of the second source if he was to be a viable competitor for out-year production contracts. Therefore, a licensing agreement was arranged. JCMPO personnel felt that if the L/F second sourcing decision had been made in the development phase, technical data rights probably would not have been a major concern to the second sourcing strategy.

In the ALCM second sourcing strategy, the rights to the technical data was not a concern because part of the selection criteria was the "winner's" agreement to accept the Leader/Follower options as stated in the RFP.

The question of data rights did not surface in the DSMAC acquisition because not only did the Government own the data but actually possessed the data. However, the Memorandum of Agreement between the Government and McDonnell Douglas Astronautics Corporation (MDAC) carefully spells out the Government's rights to the data [17:8].

The technical data rights presented a problem in the RMUC/INE acquisition. The decision to second source was made in the development phase and it was the Government's intention to acquire unlimited rights to the data. However, Litton's Guidance Control Systems Division (GCSD) claimed technical data rights to portions of their design proposal. The Government did not question these claims as they did the WRC claim. However, Litton would accept a Leader/Follower arrangement by licensing another Litton Systems division to produce RMUC/INE. Under this arrangement, the Government would not be charged a licensing fee.

In light of the JCMPO experiences, the Government's ownership of technical data appears to be essential to a Leader/Follower decision and that early second sourcing planning will facilitate the acquisition of these rights. Therefore, this researcher would suggest that the T-R L/F Model does not adequately address the "technical data" variable and its relationship to time for reasons cited above.

f. Characteristics of the Industry and (Potential) Contractors

The Model states that the willingness and ability of the Leader and Follower is a factor to be considered in the L/F decision. However, it does not discuss means of "motivating a contractor" to be "willing" to accept a L/F arrangement. In fact, the final report states that the contractor saw this technique as just "another cost of doing business" [34:B-11].

This was not the experience of the JCMPO. In each case, the potential "leader" saw L/F as means to reduce their business base and potential profits. In the engine and RMUC/INE acquisitions, the JCMPO had to threaten development of an alternate design which would further reduce their chances for business before they would consider licensing their designs.

In the ALCM acquisition, the Boeing Aerospace Company (BAC) and General Dynamics/Convair (GD/C) accepted the L/F options only because it was part of the source selection criteria. BAC indicated that a Follower was not necessary provided they were the "winners", however, if GD/C won the competition, BAC wanted to be the Follower. GD/C appeared to be even less interested in the L/F options because they felt they would not be the Follower if BAC "won" the competition and didn't need a Follower if they won.

In the DSMAC acquisition, McDonnel Douglas agreed to the L/F second sourcing strategy because they wanted production rights to DSMAC.

In light of JCMPO experiences, this researcher observes that a Program Manager should consider means to motivate a "potential Leader" to accept the L/F second sourcing strategy and that the "timing" of the L/F decision will determine its importance in L/F planning. If L/F is part of the selection criteria, then the "potential Leader" will most likely accept L/F as was the case with ALCM and

DSMAC. If, however, the selection of the producer is made before the second sourcing decision, then the threat of loss of future business may prove effective, as JCMPO intends to do with WRC and the future MRASM engines. The threat to develop an alternate design may also be effective as it was with Litton in the RMUC/INE acquisition.

Another factor which the T-R L/F Model should have addressed was the (potential) contractors' concern that sufficient quantities of a unit will be procured to warrant capital investment of two contractors in the project. This was a major negotiation point for both Litton in the RMUC/INE agreement and McDonnell Douglas in the DSMAC agreement. In both cases the Government (JCMPO) agreed to reimburse the contractor for the unamortized portion of their investments if the Government cancelled the projects before specified quantities were acquired. This agreement was not a problem for JCMPO because this project is a strategic program and strongly supported by DOD and Congress. However, this may create problems for another Program Manager attempting to utilize the L/F technique because he/she may not have the authorization to obligate the Government in this manner.

2. <u>Detailed Analysis</u>

The detailed analysis required by the Model examines the "cost" and the "availability" objectives if second sourcing using L/F is considered feasible. Drawing from JCMPO experience, a detailed cost, schedule (availability) and risk

analysis was conducted in each case to determine the feasibility of using L/F or other second sourcing techniques. The most common alternative to L/F was Form, Fit, and Function. In all cases, L/F or DL was considered the more cost effective and risk averse method of second sourcing for the JCMPO acquisition.

If Preliminary and Detailed analyses show that Leader/Follower is a viable second sourcing technique then the user of the Model moves into the next phase, How to Use Leader/Follower.

3. How to Use Leader/Follower

a. Form

The Model suggests the three contractual relationships described in DAR [20:4-701]. However, it does not comment on which method is most advantageous to successful Leader/Follower implementation. The JCMPO has either planned to use or used the first suggested relationship, requiring the "Leader" to subcontract with the "Follower." The driving reasons for selecting this contractual relationship was the belief held by JCMPO that this method would maximize commonality and minimize Government involvement in the technology transfer. This method shifts the responsibility for "completeness" and "accuracy" of specifications to the Leader rather than the Government. Since JCMPO did not use the other two procedures, this researcher cannot comment from an experience point of view. However, interviewees felt that the other

methods were more appropriate for the shipbuilding industry where "cooperation" rather than "competition" is the driving consideration because these methods would appear to "lessen" the Leader's perception that the Follower is taking his business. In addition, in shipbuilding, the Government takes a much more "active" role in the system's design and is, therefore, in a better position to give assistance to the Follower.

b. Incentives

The second factor discussed in the Model is the use of incentives to ensure successful Leader/Follower implementation. One incentive cited by the Model is tying progress payments to L/F milestones. The importance of incentives, especially "negative" incentives, can best be appreciated by analyzing the Memoranda of Agreement (see Appendices C through E) negotiated by the JCMPO as they gained experience in technology transfer. The agreement in the JCMPO's first attempt at technology transfer, the engine procurement, did not contain any negative incentives and technology transfer has not been a success. In the RMUC/INE procurement, the threat of terminating the agreement if the two Litton Divisions did not tranfer the technology on schedule appeared to be sufficient in this case because the profits of both divisions stayed in the same corportation. In this acquisition, technology transfer was successfully completed. Recently, JCMPO and McDonnell Douglas (MDAC) signed an agreement which

contained very stringent negative incentives if MDAC fails to select a competent Follower and qualify him per the technology transfer schedule.

Positive incentives were also stated in the Memoranda of Agreement. Some of the positive motivating factors considered or used by JCMPO in the various acquisitions were: (a) structuring an award fee around the accomplishment of L/F milestones, (b) basing the Leader's split for the first competitive contract on his performance during the technology transfer phase, and (c) guaranteeing the Leader a specific percentage of the yearly production quantity which may or may not be above the minimum sustaining rate.

The selection of a Follower is not addressed by the Model. The final report does address the importance of selecting a technically qualified Follower, however, it does not address possible problems the Program Manager may encounter if the "Leader" rather than the Government competitively selects the Follower. WRC wanted to select a totally unqualified engine licensee. Government personnel felt that their "hands-on" involvement in the Teledyne (TCAE) selection avoided even more problems with the engine acquisition. If they had not conducted their own on-site surveys of the prospective licensees then Williams might have successfully selected, with the Government's approval, a contractor who was less qualified than TCAE.

Another implementation factor, the Government's relationship with the Leader and Follower, was not addressed in the Model. JCMPO personnel feel that part of the success of the RMUC/INE second sourcing can be attributed to the appointment of a single contact point in the project office for the companies to contact if they experienced problems in the technology transfer phase. This was not done for the engine technology transfer phase and Teledyne did not take the initiative and contact JCMPO when L/F problems surfaced. After these two experiences, JCMPO intends to take an active and aggressive role in any future Leader/Follower acquisitions.

The final factor the Model addresses under L/F implementation is contract monitoring. The Model suggests in-process reviews to monitor L/F performance, however, it does not stress its importance to L/F implementation. Again, the engine acquisition points out its importance. DCAS is not organized to monitor the technology transfer aspect of the contracts and JCMPO personnel had not anticipated this problem as they felt that Teledyne would surface any implementation problems. In the future, joint program reviews will closely monitor the engine L/F milestones and the cost performance reports required by C/SCSC.

C. SUMMARY

1. Conclusions

From the above analysis, it is the finding of this researcher that the Thompson-Rubenstein Leader/Follower

(T-R L/F) Model does not adequately address the competitive nature of the Aerospace Industry. The underlying assumption of the Model appears to be that the Leader will cooperate with Leader/Follower implementation with little or no pressure from the Government. This assumption may hold true for the shipbuilding industry, but is inappropriate for the Aerospace Industry.

The following specific conclusions can be drawn from the application of the T-R L/F Model to the JCMPO acquisitions.

a. The Model effectively defined the variables to consider when making a cost savings second sourcing analysis.

b. The reasons for early second sourcing planning were not adequately addressed by the Model.

c. The Model does not adequately address the acquisition of technical data rights.

d. The "How to Use" section is inadequate for proper L/F implementation planning.

2. Recommendation

In light of the deficiencies of the Thompson-Rubenstein Leader/Follower (T-R L/F) Model, especially in its "How to Use" section, this researcher recommends that the T-R L/F Model be modified to reflect the competitive nature of the Aerospace Industry as supported by experiences of the Joint Cruise Missile Project Office. The next Chapter of this thesis proposes a modified L/F Model for a Program Manager's considerations.

VII. PROPOSED LEADER/FOLLOWER MODEL

A. GENERAL

The purpose of this Chapter is to present a Leader/Follower Model that reflects the competitive nature of the Aerospace Industry as supported by the experiences of the Joint Curise Missile Project Office. Since this Model is based on Aerospace Industry experiences, it will probably be more useful to a program manager working in this environment.

The Model is a simulation model and attempts to present a framework for determining if second sourcing is feasible and if the Leader/Follower technique is a viable approach to second sourcing. The Model is divided into three major sections: (1) The Second Sourcing Analysis/Decision, (2) The Leader/Follower Decision, and (3) Leader/Follower Implementation. In each section, the Model attempts to identify critical factors and where L/F does not appear to be a viable technique, it suggests alternate second sourcing techniques. Many factors in the Model are closely interrelated, however, the Model attempts to logically consider each variable as a Program Manager might in determining if L/F is applicable to his/her program. This Model will be most effective if the program manager is considering the L/F second sourcing technique in the developmental phase of the program; however, it does attempt to consider options that a program manager might consider if the system is in the production phase.

B. SECOND SOURCING ANALYSIS/DECISION

1. Objectives

If the primary objectives for establishing a second source are: (a) cost savings, (b) assuring a source of supply, (c) meeting delivery requirements which cannot be achieved by one supplier, and (d) maintaining the mobilization base, then there are several second sourcing techniques a program manager may consider such as: (a) Technical Data Package (TDP), (b) Form, Fit, and Function, (c) Directed Licensing (DL), and (d) Leader/Follower (L/F). If an additional program objective is standardization (commonality) of the system, subsystem or component, then Form, Fit, and Function would not be an appropriate second sourcing technique.

2. Cost Savings Analysis

The basic purpose of this analysis is to determine if cost savings can be anticipated if competition is maintained through production. This analysis would be critical to the second sourcing decision if cost savings was the primary objective for second sourcing. However, if assurance of supply or the maintenance of the mobilization base is the driving objective, then this analysis will not be as critical to the second sourcing decision.

Most cost analyses are based on learning curve projections. When the Program Manager reviews the analysis he should carefully consider several variable that such an analysis usually assumes such as program stability, duration, the minimum sustaining rate, the learning curve projection, and the time it will take to qualify the second source.

a. Program Stability

The quantities used and program duration assumed by the analysis are heavily dependent on the stability of the program. If the program has DOD and Legislative support and planned acquisition quantities are large enough, then projected cost savings may be justifiably anticipated. However, if there is a possibility that the program will be cancelled or the quantities reduced, then the second source initial start-up costs will not be paid for by out-year acquisitions.

b. The Minimum Sustaining Rate

An underlying assumption of second sourcing is that two sources will be maintained. Therefore, the cost analysis should consider a quantity split such that both sources are sustained. Early planning will facilitate the amount and type of tooling procured by the developer and the second source. If the second sourcing decision is made during production, the developer may have already procured tooling sufficient to produce the total yearly quantities and, by second sourcing, the developer's production capacity may be under-utilized and therefore, not cost effective.

c. Learning Curve Projection

Anticipated learning curves for sole source and competitive procurement of the system are compared. These estimates are usually based on industry experience; however, the program manager should carefully analyze these estimates, especially if the projected cost savings are relatively small.

d. Qualify the Second Source

The analysis should also consider how long it will take to qualify the second source to produce the Leader's design. If there are sufficient quantity requirements to justify waiting until the system design is stabilized and the Government owns the technical data package, the TDP may be the appropriate second sourcing technique. However, the faster the second source is qualified, the sooner the cost savings will be realized. Both DL and L/F are designed to qualify a second source prior to the Government's proofing of the design package. In addition, TDP may be ruled out because there isn't sufficient time to wait for design proofing if the second source is to be a viable competitor for out-year production contracts.

3. Industry Interest

Closely related to industry interest in a specific program is the industry's perception of the program's stability. A firm will not, most likely, be interested in investing its resources in a program that appears to be lacking either DOD or Congressional support because the return on its investment

will not be of an "acceptable" level since the program could be cancelled prior to or during production. Therefore a guarantee to reimburse a firm for its capital investment, if the program is terminated or severely cut back, may be required of the Government before a firm will consider participating in a Second Sourcing Strategy.

C. THE LEADER/FOLLOWER DECISION

1. General

If the Second Sourcing Analysis indicates that second sourcing is desireable and that Leader/Follower may be a viable second sourcing technique, then the porgram manager should consider several additional factors before making a L/F decision including technical data rights, technical complexity, reprocurement data package, motivational factors, political consideration, and the extent of subcontracting.

2. Technical Data Rights

If L/F is to be a viable alternative for second sourcing, then the Government must acquire ownership of the technical data rights. These rights will be more easily acquired if the decision to second source using L/F is made in the early stages of the program and the developmental contract includes the clause to acquire unlimited data rights. If the decision to second source is made at the completion of the system's development, then it is more likely that the developer will claim proprietary data rights which he will refuse to transfer to the Follower. If investigation proves the validity

of this claim or the program lacks the necessary time to investigate these claims prior to second sourcing implementation, then L/F may not be a feasible second sourcing methodology. The program manager might, at this point, explore the possibility of using DL, or Form, Fit, and Function if commonality is not a driving objective.

3. Technical Complexity

The purpose of L/F is to provide a method of transferring highly complex technology to the second source and this transfer would only be successful if the designer (Leader) assisted the Follower. The use of L/F would be inappropriate if the technology used in the system is widely known and used in the industry.

4. Reprocurement Data Package

Closely tied to this variable is Technical Complexity. If there is available a complete and accurate reprocurement data package and designer technical assistance is not necessary, then the more traditional second sourcing technique, TDP, should be considered. The importance of this factor will depend on the timing of the second sourcing decision. If the program is in production, then the possibility of a complete data package is more likely, making TDP the more appropriate technique.

5. Motivational Factors

One very distinct drawback to L/F is the natural reluctance of the Leader to educate a competitor. The program manager contemplating the use of L/F should plan to motivate the Leader to accept L/F. The necessity of motivating the Leader is closely tied to the timing of the L/F decision. If the decision to second source is made in the developmental phases of the program, then the program manager can capitalize on the design competition by making a priced out Leader/ Follower option part of the source selection criteria. This may also alleviate any problems over technical data rights.

The decision to implement L/F is not always made, however, before design selection. If this is the case, claims of proprietary data will most likely impede L/F implementation. A possible tact that a program manager may consider is the development of an alternate design,(Form, Fit, and Design), if development costs are not prohibitive and commonality is not a driving objective. This threat may induce the developer to counter this acquisition strategy with a DL arrangement. Another avenue the program manager may try is guaranteeing a specific percentage of the yearly production buy. However this tact may reduce the competitive potential of L/F if the quantity guaranteed is greater than the minimum sustaining rate.

6. Political Considerations

Congress, as a whole, approves and encourages the use of competition in Government contracting; however, constituency interest may override this philosophy for an individual Congressman. The Program Manager should consider the "Leader's" influence on his Congressmen and the importance of the L/F decision. It is possible that a few Congressmen have enough influence to cause the withholding of required second sourcing funding. It may be that a program manager may have to compromise an individual decision in order to accomplish a more important program goal.

7. The Extent of Subcontracting

If a major portion of the system is subcontracted, then requiring the designer to establish dual subcontracting sources may be the most cost effective way to achieve the intended L/F objectives. The critical decision criteria would be that additonal projected cost savings substantially exceed the cost of implementing L/F. This factor should be closely examined when considering second sourcing an entire system or major subsystem.

D. LEADER/FOLLOWER IMPLEMENTATION

1. Procedures

DAR suggests three methods for establishing a Leader/ Follower relationship [39:4-702]:

a. The Leader subcontracts with a Follower and provides technical assistance and know-how to the Follower.

b. The Government contracts directly with the Leader and Follower. The Leader's contract requires that he provide assistance to the Follower.

c. The Government contracts directly with the Leader and Follower. The Follower's contract requires that he subcontract with the Leader for assistance.

The actual procedure the program manager selects appears to depend on two factors: (1) the second sourcing objectives, and (2) the Government's involvement in the design of the system. Procedures "b" and "c" appear to reduce the Follower's dependency on the Leader; and, therefore, the competitive environment would be minimized. Procedures "b" and "c", also, appear to be more appropriate if the Government is actively involved in the design of the system and the Leader does not have "more" knowledge than the Government. Procedure "a", however, appears to be more appropriate if the Leader has in-depth knowledge and Government assistance would be insufficient if the Leader and Follower were not working closely with each other.

2. <u>Technology Transfer Planning</u>

The first step to successful L/F implementation appears to be the establishment of a definitive Technology Transfer Plan (TTP). The Plan should specify specific dates

for milestone accomplishment and the date that the Leader will qualify the Follower as a capable producer of the system.

The TTP should also address configuration management. In order to facilitate communication, both the Leader and the Follower would be part of the configuration management board; however, the Leader is usually assigned configuration control responsibility. Specific turn-around times for configuration changes should be specified to avoid the Leader holding out on the Follower.

The TTP should also address testing requirements that the Leader will perform for the Follower, if any. As with the configuration management, the plan should specify turn-around times.

3. Motivational Considerations

The importance of this factor cannot be overstated. A contract may state that technology transfer will happen; however, the longer a Leader takes to qualify a Follower the better his competitive position because he continues down the learning curve while the Follower falls behind. Therefore a program manager should consider using both positive and negative incentives especially the latter, to ensure technology transfer occurs on schedule.

Possible positive incentives are:

a. Establishing an award fee arrangement which provides incentives for the Leader's management of the Follower.

b. Base the Leader's portion of the first year's fully competitive buy on his performance during the technology transfer phase.

Possible negative motivational factors are:

a. Tying progress payments to L/F milestones.

b. Requiring the Leader to meet the Follower's delivery schedule. However, the Leader would not be paid for these units until the Follower delivers.

c. Publicize a low award fee.

In order to ensure that all parties understand their duties and responsibilities, a Memorandum of Agreement should be prepared which spells out schedule requirements and the motivational factors. This document would be signed by the Government, the Leader and the Follower, if selected prior to contract award.

4. Follower Selection

The selection of the Follower may be accomplished by (1) Government selection or (2) requiring the Leader to competitively select the Follower. The criteria for selecting a Follower would be the same criteria used to select the Leader with the exception of subcontracting experience.

The Follower should be capable of working from another company's drawings and extensive subcontracting experience would indicate this ability exists.

If the Leader selects the Follower, the Government should reserve the right to approve the selection of the Follower. The Government should be actively involved in this selection process and not just a "reviewer" of the selection criteria because, if competition is the ultimate goal, the Leader will, most likely, select a Follower who is either technically "weak" or sees himself as a subcontractor to the Leader. In either case, the technology transfer would be slowed down and the Leader's competitive position will be enhanced because he "will continue down the learning curve" as the Follower falls behind. If the Follower is technically weak it will take longer to "educate" him. On the other hand, if the Follower sees himself as a subcontractor, then he will wait for the Leader's direction which will most likely be slow in coming, thus "stretching out" the Technology Transfer.

The decision as to whether the Government or the Leader selects the Follower may be dependent on three factors: (1) the Government's contractual relationship with the Leader, (2) the resources of the project office, and (3) Leader/Follower compatibility. If the potential Leader is a subcontractor to a Government prime contractor, then the prime is contractually obligated to select or oversee the selection of the Follower.

However, the Government does retain the right to approve all subcontracts [20:7-700]. On the other hand, the Government may direct the prime to contract with a specified subcontractor as part of its contractual obligations but the Government hesitates to use this option because of the other two factors.

It takes considerable resources on the part of the Government's project office to draft the Request for Proposals and selection criteria. The program office may not have the personnel to prepare these documents in a timely manner. Therefore, the project office may opt to have the Leader select the Follower in order to conserve its resources. If this is the case, the Government assumes a "reviewer's" role of the Leader's RFP and selection criteria. However, the Government does risk the possibility that this "reviewing" will not adequately ensure that the Leader's RFP and selection criteria are detailed enough to permit the potential Followers to "intelligently" submit technical and cost proposals.

The third factor, compatibility, may encourage an agreement between the Leader and Follower that neither will take over the program by "low-balling" the future competitive contracts. The program office may avoid this by guaranteeing a minimum sustaining rate to both. On the other hand, the Government should reserve the right to select one contractor if performance or pricing dictate that the other is not a viable competitor.

"Low-balling" is a possibility regardless of who selects the Follower and ensuring realistic pricing is the best way to avoid its use.

5. <u>Government's Relationship with Leader and Follower</u>

For successful L/F implementation, it appears that the project office should take an active and aggressive monitoring role. DCAS organizations are neither funded nor organized to monitor this aspect of the contract, therefore, the program manager should appoint a single contact in the project office for L/F monitoring. This individual should contact both the Leader and Follower and explain that he is the expeditor for L/F implementation and instill into the Follower that the Government is the customer, not the Leader.

6. <u>Feedback Considerations</u>

Closely related to the success of the L/F implementation is the establishment of feedback systems. The use of cost performance reports required by C/SCSC is one way to monitor L/F performance. However, these reports are only useful if the progress reported is, in fact, accomplished. In relation to C/SCSC the contract type selected for the technology transfer phase should allow the use of this reporting criteria.

Another monitoring device could be the requirement that L/F progress be reported at joint program reviews. This would emphasize the importance of this aspect of the contract

and the program managers for the Government, the Leader and the Follower could discuss implementation problems and the menas to corect them. It would, also, provide positive feedback if L/F implementation was on schedule.

E. USE OF THE MODEL

There has been no attempt to graphically depict this Model because this will tend to prioritize the variables discussed. The characteristics of a particular program and the timing of the L/F decision will dictate the importance of the variables. The prioritization of the variables will be part of the "tailoring" process; however, the Model does attempt to identify critical decision variables depending on the timing of the second sourcing planning.

VIII. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

As a result of this study, the following conclusions are presented:

Conclusion #1. The Thompson-Rubenstein Leader/Follower (T-R L/F) Model does not reflect the competitive nature of the Aerospace Industry.

The underlying assumption of the T-R L/F Model appears to be that the Leader will cooperate with the Leader-Follower acquisition strategy. This is best illustrated by the statement in the Thompson-Rubenstein final report that L/F is "another cost of doing business." However, in each of the Joint Cruise Missile Project Office (JCMPO) acquisitions, the Government had to use some "threat" to get the Leader to accept the strategy. The Aerospace Industry is very competitive and, in the past, once a design was selected for production, the designer had seen himself as the sole source producer. Therefore, a Program Manager considering the use of Leader/Follower should plan to "motivate" the designer to accept the use of the L/F acquisition strategy.

Conclusion #2. The Thompson-Rubenstein Leader/Follower (T-R L/F) Model appears to more accurately reflect the Shipbuilding Industry use of Leader/Follower.

In the Shipbuilding Industry, L/F is used to maintain the industry business base and encourage commonality. Usually,

both the Leader and Follower are prime contractors to the Government which lessens the preception that the Follower is taking business from the Leader. Therefore, the contractors are more cooperative in accepting and implementing L/F because it is recognized neither contractor has the opportunity to receive the total contract award. In the Aerospace Industry, the possibility exists that the Government may award the total quantity or the majority of the quantity to a single contractor; thus, maintaining the competitive environment. The Model depicts a "cooperative attitude," not a competitive attitude, especially in the Model's implementation planning.

Conclusion #3. The Thompson-Rubenstein Leader/Follower (T-R L/F) Model does accurately reflect the variables that a Program should consider in evaluating the cost analysis.

An analysis of various cost projection models substantiate the importance of the T-R L/F Model's cost related variables. By using the T-R L/F Model, a Program Manager will consider the various assumptions built into a cost analysis, and therefore, more accurately evaluate its relevance to his/her program.

Conclusion #4. The Thompson-Rubenstein Leader/Follower (T-R L/F) Model does not address the importance of planning for the acquisition of technical data rights when considering the use of Leader/Follower strategy.

The use of Leader/Follower was not possible in the engine acquisition because the Government failed to establish clear

ownership of the rights. JCMPO personnel felt L/F would have been a viable second sourcing method if they had acquired the technical data rights while in the development phase. Therefore, this variable should be included in the Model as a critical decision variable.

Conclusion #5. The Thompson-Rubenstein Leader/Follower (T-R L/F) Model does not identify the "Extent of Subcontracting" as a critical decision variable in the Leader/Follower decision-making process.

The decision not to implement L/F in the ALCM and the Guidance Sets acquisitions was based on the extent of subcontracting utilized by the designers (potential Leaders). It was determined that the establishment of competitive subcontractors was the most cost effective method to achieve L/F objectives of cost savings and assurance of supply. Therefore, this factor should have been addressed in the Model.

Conclusion #6. The Thompson-Rubenstein Leader/Follower (T-R L/F) Model is inadequate for L/F implementation planning because it does not address: (1) Follower selection, (2) negative motivational factors, and (3) monitoring procedures.

Again the Model appears to assume cooperation in implementing L/F. However, based on JCMPO experiences, Aerospace firms will attempt to impede L/F implementation by selecting a "weak" Follower and/or not adhering to the technology transfer schedule in order to put the Follower at a competitive disadvantage.

The Model should have reflected this attitude and recommended proper selection and monitoring procedures to ensure successful L/F implementation.

B. RECOMMENDATIONS

As a result of this research, the following recommendations are offered:

Recommendation #1. The Government should, in all cases, either select the Follower or approve the Follower selected by the Leader.

A proposed change to Leader/Follower procedures in the Defense Acquisition Regulation (DAR) omits the requirement that the Government approve the Leader's selected Follower. JCMPO experiences demonstrates that the Leader will attempt to select a "weak" Follower. Therefore, the DAR Working Committee should re-instate this requirement in its proposed change.

Recommendation #2. A Program Manager, attempting to use Leader/Follower (L/F) should appoint an individual in the Project Office to monitor Leader/Follower implementation.

A single manager, as illustrated in the Engine and RMUC/INE acquisitions, is necessary for successful Leader/Follower implementation. The DCAS organization is not funded to provide a single manager if the Leader and Follower are located in different regions. Therefore, a Program Manager should not rely on DCAS to monitor the L/F aspect of the contract.

Recommendation #3. A Program Manager should establish firm negative motivational factors, such as tying progress payments to L/F milestones, to ensure the Leader maintains the technology transfer schedule.

An analysis of the various JCMPO Memoranda of Agreement underscores the importance of this aspect. As the Project Office became more experienced in technology transfer, negative motivational factors were included in the Agreements. This was necessary to ensure that the technology transfer schedule was maintained. Therefore, when drafting and negotiating the Technology Transfer Agreement, the Project Manager should include negative, as well as positive, motivational factors.

Recommendation #4. The Model developed as a result of this study should be used by Program Managers considering or attempting to use the Leader/Follower methodology as a second sourcing strategy.

As this Model is based on Aerospace experience, it will probably be more useful to a Program Manager dealing with Aerospace firms. These Program Managers should be directed to evaluate the applicability and usefulness of the Model and to provide feedback to the Acquisition Research Community, (e.g. the Center for Acquisition Research (NCAR)), in the form of modifications or additions which will improve the usefulness of the Model.

C. ANSWERS TO RESEARCH QUESTIONS

1. What are the significant aspects of applying the Thompson-Rubenstein Leader/Follower Model? The fact that this Model more accurately reflects the Shipbuilding Industry, a Program Manager, dealing with Aerospace Firms, would be required to significantly "tailor" this Model before attempting to use it in his/her Aerospace program. The researcher proposes a Model in Chapter VII for use which more accurately reflects the Aerospace Industry characteristics as discussed in Chapter II of this thesis.

2. What is the Leader/Follower concept and what are the critical factors attendent to its use? Chapter II and III of this thesis address this question. Basically L/F is a second sourcing strategy which requires the designer to educate a second source so that he will become a qualified producer of the designer's system. In attempting to use L/F, the Program Manager should plan to acquire technical data rights and to closely monitor L/F implementation.

3. What are the major features of the Thompson-Rubenstein Leader/Follower (T-R L/F) Model? Chapter IV discusses the salient characteristics of the T-R L/F Model. The Model addresses L/F in three stages: (1) the Preliminary Analysis, (2) the Detailed Analysis, and (3) the "How to Use" section. The Model stresses the necessity of having a stable program before attempting L/F implementation. This is important, if cost savings is the primary objective, because

the cost to establish a Follower may not be recovered by projected savings if the Program is cancelled.

4. <u>What are the major features of the Joint Cruise Missile Project (JCMP) that lend themselves to use of the Leader/Follower acquisition strategy?</u> The Joint Cruise Missile Project is a well established strategic program and therefore supported by DOD and Congress. The project will acquire sufficient units to anticipate cost savings by introducing a second source and is sufficiently funded to establish a second source. Chapter V of this thesis reviews current JCMPO policy and acquisiton planning.

5. <u>What are the critical aspects of tailoring the Thompson-Rubenstein Model for application to the Joint Cruise Missile Project (JCMP)?</u> The Model must be "tailored" by introducing the concept of motivating the Leader to accept a L/F strategy. The How to Use Section must, also be modified to reflect the importance of planning to ensure that the Leader is motivated to: (1) select an appropriate Follower and (2) implement L/F per the technology transfer schedule. Chapter VI presents an in-depth analysis of the application of the T-R L/F Model to the JCMPO acquisitions.

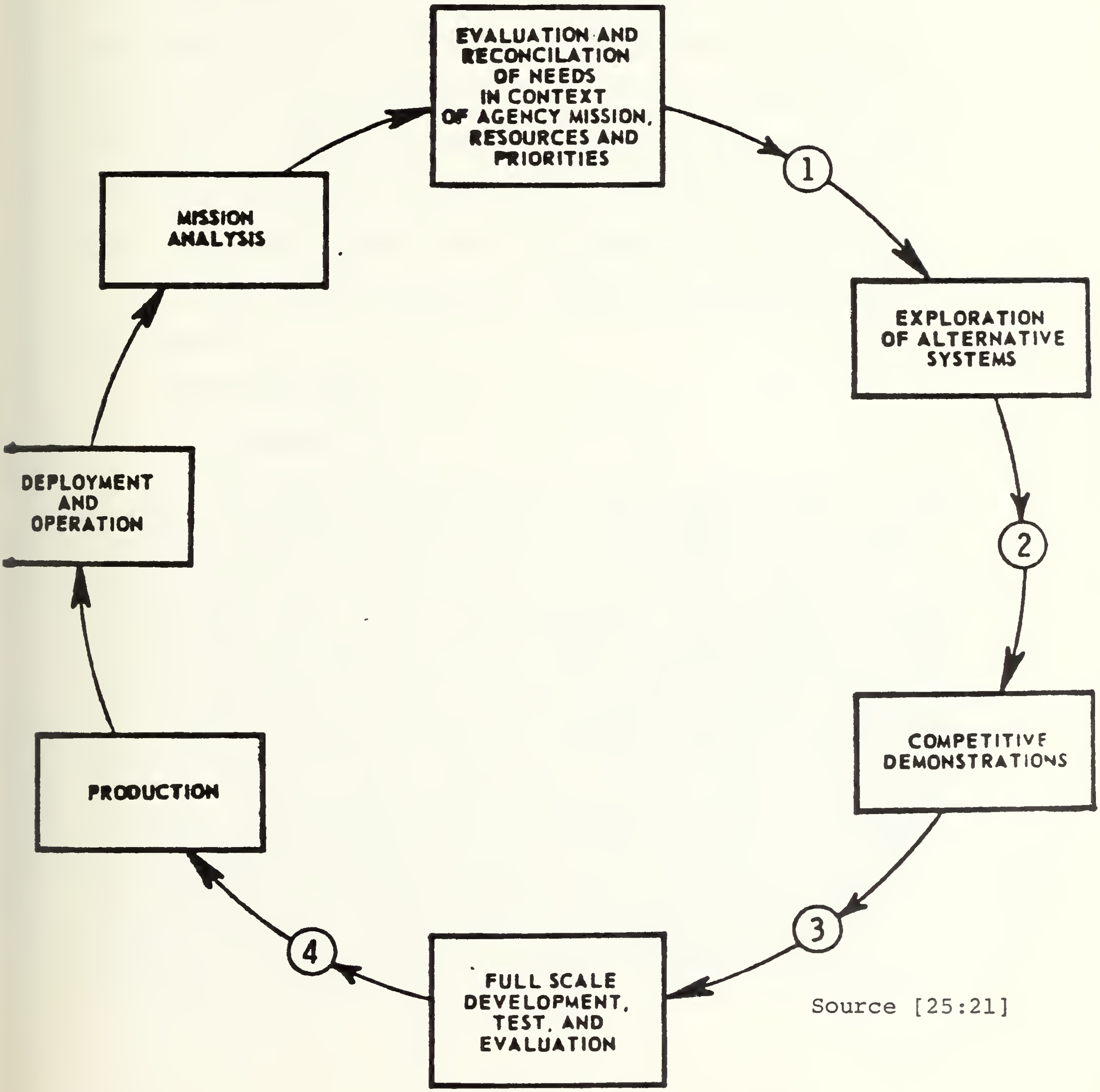
D. FURTHER RESEARCH

Further research should be conducted to determine if innovative methods of contracting, such as Fixed Price/Award Fee arrangement, would facilitate the use of Leader/Follower.

Another contracting arrangement that a researcher may consider is a Fixed Price arrangement for the Leader with a cost-type arrangement for the Follower.

APPENDIX A

MAJOR SYSTEM ACQUISITION CYCLE



Source [25:21]

APPENDIX B

This appendix presents the Leader/Follower Decision Model developed by Charles W.N. Thompson and Albert H. Rubenstein for the Air Force Business Research Management Center. The Decision Model is part of the final report for contract no. F33615-79-C-5073. The final report discusses in detail the factors of the model. Chapter IV of this thesis attempts to summarize the salient characteristics of this model and discusses the factors presented in the final report.

4. DECISION MODEL

A. Introduction

The decision model to be presented here is, in the words of the statement-of-work, to be used "... for applying the leader/follower concept to programs that involve acquisition of complex products and systems", and by "acquisition and contracting managers...". While a decision model could vary from the descriptive generalities of the present DAR provisions to an endlessly detailed branching algorithm, it appears that the most generally useful level of presentation would be in the form of a process description which identifies the factors associated with two decisions: a) whether or not to use (or consider using) leader/follower; and b) how to use it. The level of supporting detail is a more difficult question because many, if not all, of the factors, and the process for evaluating them, are common to other decisions in the acquisition process, and thus within the present competence of acquisition and contracting managers. In the presentation here, detail will be provided to highlight the specific processes used in leader/follower, with some risk of cluttering up the process with the obvious, on the one hand, or oversimplification on the other.

The model is, basically, a sequential decision (flow) model, presenting the initial decision of "whether or not to use" in a series of steps keyed to critical factors, followed by the second decision of "how to use it" in outline form.

B. Overview of the Model

As is true with many, if not all, complex decision processes, the sequence of specific, detailed decisions many vary according to the individual decision maker and the specific circumstances, and may be iterative. For convenience in presentation, the model proposes a sequence which may represent a preferred practice but, in any event, provides a check list and a frame of reference.

The Overall Decision Model appears in graphical form in Figure 1. Each of the major decision steps is described in one or more paragraphs in this section, as follows:

Whether to Use	
Preliminary Analysis	
Second Source Decision	Paragraph C
Leader/follower Decision	Paragraph D
Detailed Analysis	
Cost	Paragraph E
Availability	Paragraph F
"Other"	Paragraph G
How to Use	
Timing	Paragraph H
Form	Paragraph I
Incentive	Paragraph J
"Other"	Paragraph K

The notation in the boxes for the major steps is in three forms. First, in the boxes under "Preliminary Analysis", the references are all (except "Commonality") to the comparable factors as listed in Appendix B. Second, in the boxes under "Detailed Analysis" and "How to Use", the references are to specific objectives within the factor named "Objectives" as listed in Appendix B. Finally, the diamond shaped decision boxes identify the major decisions which control the process.

The initial point in the model, marked as START, assumes the existence of a specific decision maker (i.e., a specific acquisition or contracting manager) with some interest in considering the use of leader/follower for some specific program. The ending points in the model, marked as END, identify the several formal points at which use of the model may be terminated.

The first of the two basic decision areas, "Whether to Use", consists of two stages: first, a brief look, or "preliminary analysis", to determine whether or not the feasibility and/or desirability of leader/follower is sufficient to warrant a more extensive and detailed analysis; second, a "detailed analysis". The "preliminary analysis" is, itself, in two parts: first, an examination of (primarily) three factors to determine if development or establishment of a second source is feasible and/or desirable; second, an examination which includes three additional factors to determine if use of leader/follower is feasible and/or desirable. If warranted by the previous stage, a more "detailed analysis" is then carried out, depending upon which of several objectives is the primary purpose to be achieved.

The second basic decision area is "How to Use" leader/follower. This, again, will draw upon the previous analyses, and deals with key questions, including timing, form of contractual arrangements, incentives to assure the transfer of manufacturing assistance and know-how, and other considerations.

C. Second Source Decision

The reason for considering the decision to second source first is that the issue of leader/follower doesn't arise unless there is the necessity for establishing a second source. In the early planning the decision on the number of sources to be developed may have been assumed or otherwise established; this may be a function of the nature of the procurement, e.g., small, one-shot buys, off-the-shelf commercial products, or of the assumptions and circumstances during the establishment of the program. Where the question has not been settled, the decision is likely to be sensitive to three interacting factors. The first factor is the presence of some objective which will be advanced (or which can only be achieved) by developing a second source; while there may be several objectives, the most likely ones are achievement of some advantage in the cost (of the production buy) and assurance of supply. These objectives are, in turn, sensitive to the second factor, the characteristics of the procurement, and,

particularly, the size and the schedule. The third factor, time, enters in a least two ways: first, whether the time needed to develop a second source is available in the light of the previous two factors, and second, whether this decision is being considered early enough to allow introduction consistent with the time needed. There are other factors which may affect this decision, the most important of which is probably in the form of strong policy guidance.

D. Leader/follower Decision

If, and only if, the previous decision were to develop a source, preliminary consideration of leader/follower becomes necessary. For purposes of this decision, three additional factors are of particular significance. The first factor, commonality, tends to be assumed, but is essential; if items to be procured from multiple sources are only required to meet minimal functional requirements, i.e., "form, fit, and function", there may be little or no necessity (and it may be, in fact, undesirable) to insist upon a transfer of manufacturing information from one producer to another. The second factor, the reprocurement data base, is probably the most critical determinant of the feasibility and/or desirability of leader/follower. If the available (or expected) data base is "so complete" that potential second sources can be expected to produce and/or compete without "extraordinary" assistance from the original developer/producer, there is no need for leader/follower; if, in contrast, the data base is so inadequate (or the product is so novel and difficult to produce) that the original developer/producer will be stretched to put it into production himself, leader/follower will not only be impractical (or infeasible) but may also interfere with the original production run. Only in the "middle area" where the second source can (only) be put in a position to produce and/or compete through "extraordinary assistance" is leader/follower indicated. This introduces the third factor, characteristics of (potential) contractors, the (potential) willingness and ability of the leader and the follower. Other factors or considerations may include use of alternative techniques such as breakout or directed licensing.

E. Detailed Analysis - Cost

If the preliminary analysis indicates the likelihood that use of leader/follower for development of a second source is feasible and desirable, the next stage is to examine the question in more detail, and, for this prupose, it is convenient to conduct the analysis on the basis of the specific (primary) objective under consideration.

The achievement of savings in the cost of the production quantities requires, essentially, a comparison of cost of sole source with cost of second (or two or multiple) sourcing. On one hand is the estimated cost saving to be obtained through price competition, usually on that part of the production buy which remains after the second source is able to produce and/or compete. On the other hand are those costs associated with establishing the second source--administrative costs to the government, cost of the services provided by the leader to the follower, start-up costs of the follower, i.e., an "educational buy". For programs with very large quantities and extended production runs, it is more likely that cost savings will be realized.

F. Detailed Analysis - Availability

The objective of availability (or assurance of supply) is probably the original and/or primary basis for the development of the second sourcing technique of leader/follower, i.e., the development or establishment of a mobilization base. In the absence of such a specific requirement, two other forms of availability appear. First, where the quantities scheduled exceed the present capability or capacity of a single producer, e.g., a shipyard; second, where circumstances are anticipated which may change or otherwise interfere with the developer/producer's ability (or willingness) to produce within the planned (or desired) parameters of performance, cost, and schedule throughout the duration of the program. Analysis of the first case may be relatively straightforward if the initial (or early) production schedule is clearly inconsistent with the capacity of a single producer; where the schedule buildup is consistent with leadtimes necessary to expand facilities and staff, an experienced and stable producer may well argue that availability is not an issue. The second case is more likely to involve "prudent judgment"--is the facility "vulnerable" to environmental assault or local labor conditions; is the producer capable of building up and maintaining the desired production rate; is management stable and responsible. In either case, the objective of availability essentially requires the establishment of more than one source as "sole source" and maintaining that condition over a period of time.

G. Detailed Analysis - "Other"

Each of the previous objectives may appear, to some degree, in conjunction with the other, or with any of several additonal objectives. Where some objective other than cost or availability is the primary objective,

the analysis may vary from very brief to extensive. Commonality, or an interest in improving the quality of the product, may involve detailed consideration not only of technical design options, but also the overall useful life of the product--operations, training, maintenance, logistics, life cycle costs, etc. Socio-economic objectives, e.g., participation by minority enterprises, and responding to policy directives to "increase competition" may require little or no analysis.

H. How to Use - Timing

Except where the option to continually reassess and discontinue is unavailable, it would appear that early consideration and planning is a dominant strategy; unless second sourcing and leader/follower are clearly inappropriate, early planning not only facilitates later use but also provides lead time to industry for its planning (and avoids surprise). In general, however, early planning may be difficult because of uncertainty concerning key factors.

Where the objective is cost savings, the actual introduction of leader/follower, i.e., designating a follower and directing the leader to provide assistance, may occur relatively late in the development-to-production phase of the leader. The later the introduction the more likely the design is stabilized and the data base available; the limit on delay is the necessity for having the follower capable of producing and/or competing while there are still significant production quantities remaining.

Where the objective is availability, it is usually necessary to initiate leader/follower at or near the beginning of the development. If capacity is the issue, it is an initial condition; if anticipated future conditions is the issue, delay increases the exposure and, in addition, may increase the difficulty of introduction.

I. How to Use - Form

The form of contractual arrangement may be direct or indirect, and may vary during the several stages of the program. Where the objective is cost, the initial stage of establishing the second source may be carried out in any of several ways--through a subcontract from the leader to the follower, through separate prime contracts (with a contractual provision requiring the leader to provide assistance), or even a subcontract from the follower to the leader assistance. During the competitive procurement stage, the

form may be parallel prime contracts or a "winner-take-all" single prime contract. Where availability is the objective, any of the above forms may be used, but the maintenance of multiple sources over extended periods suggests the eventual use of parallel prime contracts.

J. How to Use - Incentives

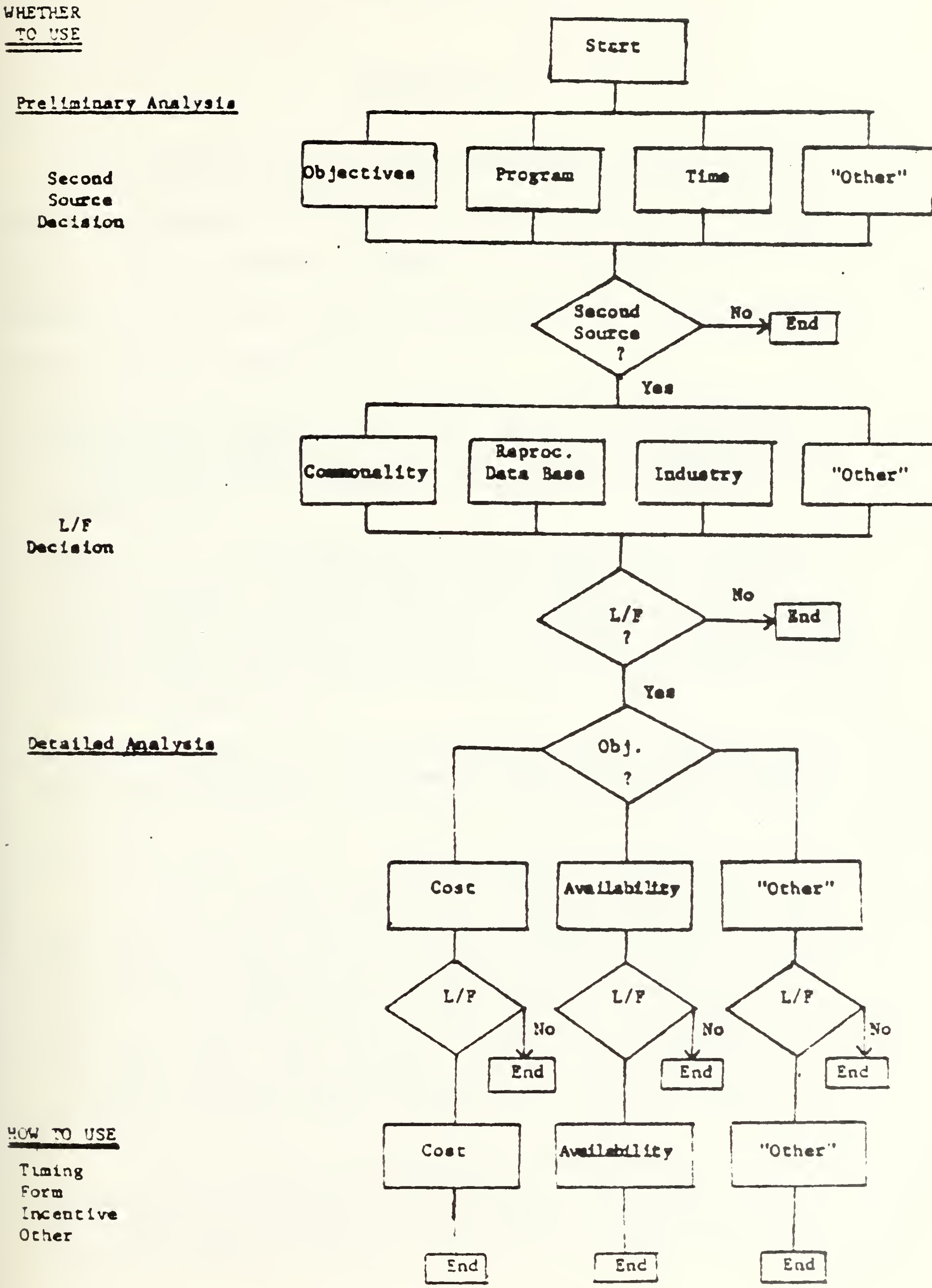
A wide variety of incentives are available, depending upon the purpose to be achieved and upon the circumstances of the parties. The key, specific incentives are directed to assuring that the leader provides the requisite manufacturing assistance and know-how and that the follower accepts it. For the leader, in addition to recompense for his services, financial incentives may be tied to progress payments and to production delivery. Inspection, testing, and validation requirements can be used to determine whether the assistance has been successful, and various types of in-process review may be used.

K. How to Use - "Other"

Because leader/follower is a specialized technique within the overall procurement process, many methods and techniques may be applicable. Particularly where cost is a primary or secondary issue, cost containment methods will be applicable. Issues of commonality suggest the use of the extensive methods which apply even under sole source conditions.

Figure 1

OVERALL DECISION MODEL



APPENDIX C

This appendix presents the Licensing Agreement that Williams Research Corporation (WRC) and Joint Cruise Missile Office (the Government) signed. In this agreement, WRC agreed to license a second source for the production of the Cruise Missile Engine F-107.

WHEREAS, Section J-18 of Contract N00019-78-C-0206 provides that a determiniation of rights in technical data nd computer software for the F107 series engine may be accomplished when deemed desireable or necessary by the parties: and

WHEREAS, the Government and WRC desire to establish a second source (hereinafter to be referred to as "the Licensee") for the manufacture of engines with the goal of duplicate sources for all of the items listed on the Manufacturing Parts List for Cruise Missile Engine Model Number F107/ WR19 Report Number 78-142 (as updated from time to time); and

WHEREAS, conditions of establishment of a second source involve a licensing agreement which will be reflected in a modification to Contract N00019-78-C0206; therefore

The Government and WRC hereby agree as follows:

1. The parties hereto agree to promptly pursue, in good faith, the determination of rights in technical data and computer software in accordance with the clause of Contract N00019-78-C-0206, Section L, entitled, "Rights in Technical Data and Computer Software (1977 Apr)". However, the determination of the extent to which the Government has limited versus unlimited rights to technical data and computer software will not affect royalty payments, use of technical data and computer software, or any other conditions as agreed to herein.

2. The use by the Government of technical data or computer software delivered to the Government to establish another domestic source other than the Licensee of the F107 engine without the technical assistance of the

Contractor is not precluded by this agreement. Any agreement covering another domestic source other than the Licensee and royalties or payments due the Contractor thereunder will be affected by the aforementioned determination of rights in technical data and computer software. Should the determination of rights result in the Government agreeing that certain technical data and computer software is subject to limited rights, the Government may acquire unlimited rights in such limited rights data.

3. Prior to completion of the aforementioned determination of rights in technical data and computer software, the Government has the right to use any limited rights technical data and computer software furnished to the Government for purposes of procuring F107 engines, directly derived versions of the engine, and associated logistic items for cruise missiles from the Licensee.

4. Notwithstanding Paragraph 3, the Government will only procure F107 engines and associated logistic items directly from the Licensee which are in excess of the Contractor's ability to satisfy either the quantity or schedule requirement of the Cruise Missile Program or to produce at a reasonable price. This does not preclude the use of unlimited rights technical data or software for direct procurement of associated logistic items from the Licensee or any other source.

5. For F107 engine procurements by the Government that exceed an average of 20 engines per month (240 in a given year), the Government may at its option procure direct (pursuant to Paragraph 4) from the Licensee or direct the Contractor to procure from the Licensee, complete engines in a quantity up to 75 percent of the engines delivered to the Government in excess of the 20 per month average to the extent that total quantities do not exceed 100 per month average (1200 per year). For that portion of procurements that exceed 100 per month average (1200 per year), the Government may at its option procure direct (pursuant to Paragraph 4) from the Licensee or direct the Contractor to procure from the Licensee, a quantity up to 50 percent of said excess. However, for any quantity which is in excess of the Contractor's ability to satisfy either the quantity or schedule requirement of the Cruise Missile Program, the above limitations shall not apply. This production split between Contractor and Licensee will be recognized by the Government regardless of time or quantity limits of Paragraph 6 pertaining to royalty. Subject to the above maximums, the determination by the Government as to the

exact quantity of units to be procured from the Subcontractor/Licensee will be at the discretion of the Government taking into account, but not necessarily limited to, the paramount factors listed below:

a. Cost/price comparisons between the Contractor and the Subcontractor/Licensee for varying combinations of production within the limits set forth above.

b. Demonstrated capability to produce quality units on schedule.

c. Need to maintain a dual production capability in the interests of National Security.

Where the Government at its option directs the Contractor to procure complete engines from the Licensee, the Contractor may apply a predetermined rate to the Licensee's sales price to the Contractor in lieu of his normal General and Administrative expenses and fee/profit application. This rate will be subject to an advance agreement for each production buy and will be composed of General and Administrative expense in the range of 3 - 6 percent and a Fee in the range of 6 - 9 percent, the combined total of both not-to-exceed 12 percent.

6. Government procurement directly from the Licensee will be subject to payment to the Contractor a royalty at rates as follows:

a. Five percent of the sales price to the Government (excluding royalty) for the first 500 engines procured direct.

b. Four percent of the sales price to the Government (excluding royalty) for the second 500 engines procured direct.

c. Three percent of the sales price to the Government (excluding royalty) for all engines over 1000 procured direct, subject to time or quantity limitations stated herein.

d. Five percent of the sales price to the Government (excluding royalty) of those F107 associated logistic items procured direct for which the Government has limited rights in technical data and computer software.

e. The cost of any components of the engine purchased by the Licensee from WRC shall be excluded from the base against which the royalty rate is applied.

With the exception of Foreign Military Sales, royalty payments shall no longer be applicable after a period of 15 years after the date of the first production procurement from the Licensee by the Government of the delivery of 6000 production qualified configuration engines to the Government, whether procured from the Contractor, and/or the Licensee, whichever occurs first. In the event the Department of Defense undertakes a Foreign Military Sale which requires the production of the F107 engine for cruise missile application in foreign countries, the Contractor will be afforded the opportunity (unless otherwise prohibited by regulations or law) to establish a foreign Licensee in the foreign country(s) in general accordance with the terms and conditions contained herein. In the event the Contractor is not selected to establish such a foreign Licensee, the Government has the right through the use of technical data or computer software furnished to the Government to establish such a foreign Licensee subject to payment to the Contractor of a royalty in the amount of 5 percent of the cost (U.S. dollars) of the engines produced.

7. The Government shall have the right, so long as the Licensee is performing as a Subcontractor to the Contractor, to require the Licensee to disclose and grant rights to the Government to all proposals, cost history, projected costs, and other information and data to the same extent that Statutes, Executive Orders, and the Defense/Federal Acquisition Regulations require the Contractor to disclose to the Government in connection with the performance of Government contracts.

8. Limited to F107 engines, directly derived versions thereof, and associated logistic items procured from the Contractor or directly form any Licensee established pursuant to this agreement, Contractor grants to the Government an irrevocable, non-exclusive paid-up license throughout the world under any Contractor inventions, whether or not covered by patents or pending applications, used in the manufacture of or embodied in the F107 engines, directly derived versions thereof, and associated logistic items. Rights in any patents hereafter acquired by Contractor in the course of performance under Government contracts shall be determined by the patent rights clause of such contracts.

9. Notwithstanding competion of Contract N00019-78-C-0206, the provisions of this agreement shall remain in effect and apply to all Government contracts for F107 engines, its derivations and associated logistic items having cruise missile applications.

APPENDIX D

This appendix presents the second sourcing agreement signed by the Joint Cruise Missile Project Office (JCMPO) and McDonnell Douglas Astronautics Company for the production of the Reference Measurement Unit and Computer (RMUC) and the Inertial Navigation Element (INE). This appendix does not present all of the attachments to this agreement because, in the opinion of this researcher, they are not germaine to the second sourcing strategy utilized by JCMPO.

This cruise Missile Guidance Set Elements (RMUC & INE) Second Source Agreement is between Joint Cruise Missiles Project Office of the Department of the Defense of the United States Government (hereinafter referred to as JCMP), McDonnell Douglas Astronautics Company (hereinafter referred to as MDAC) and Litton Systems, Inc. (hereinafter referred to as "Litton").

WHEREAS, the Guidance & Control Systems Division of Litton (hereinafter referred to as "G&CSD") has designed and developed the Reference Measurement Unit and Computer and the Inertial Navigation Element (hereinafter referred to as "RMUC" or "INE") used for the Cruise Missile Guidance Set;

WHEREAS, MDAC in response to JCMP direction desires to establish a second or alternate source of manufacture for the Cruise Missile Guidance Set RMUC and/or INE as an integral part of the Cruise Missile Program;

WHEREAS, Litton Offers and agrees to the commitments/guarantees as set forth herein, in consideration of the MDAC and JCMP acceptance of Litton Systems Canada Limited (hereinafter referred to as "LSL") as a second source or alternate source;

NOW, THEREFORE, MDAC and Litton and JCMP agree as follows:

I. SCOPE

A. This Agreement applies to the RMUC and INE for the Joint Cruise Missiles Project Programs including but not limited to the nuclear Land Attack versions of the BGM-109, AGM-109 and AGM-86.

B. In accepting Litton's offer, MDAC, and JCMP commit that no offers will be solicited from, no award made to and no agreement for support entered into with any other second or alternate source for Cruise Missile Guidance Set Elements utilizing the same generation or general type of technology as in the cujrent RMUC/INE. These conditions are restricted to the nuclear land attack versions of the BGM-109, AGM-109, and AGM-86. This commitment is also conditioned that Litton will meet its obligation under this agreement and that the agreement is not terminated pursuant to any of the provisions of Section XI herein.

C. G&CSD shall be responsible for the transfer of the technical capability to LSL and the establishment of LSL as a qualified second or alternate source, in accordance with attachment A. Thereafter, upon request from LSL, G&CSD shall assist LSL in making any required changes to designs, manufacturing processes, inspection processes, or qualification of any alternate vendors.

D. After the establishment of LSL as a second or alternate source, it is recognized that G&CSD and LSL shall work as independent contractors with neither having any responsibility for cost, schedule, or performance for the other entity.

E. The abbreviations and designations used herein shall be per attachment B.

II. FINANCIAL CONSIDERATION

A. The costs for disclosure associated with the technical transfer to LSL of the ability to build the RMUC and/or INE will not be chargeable to any subcontract under a MDAC contract with the JCMP or any government contract.

B. There shall be no royalty charges or license fees to MDAC or the JCMP for the transfer of data, equipment, and capability relative to the RMUC and/or INE to LSL.

C. Should this Agreement be cancelled, suspended, or terminated prior to expiration of 10 years for any reasons other than default by Litton, LSL or G&CSD or violation by Litton, LSL, or G&CSD of any contract provision, Law or Regulation requiring cancellation suspension or termination, or should the production quantities of the Cruise Missile Guidance Set Systems be less than 4,000 Litton shall be paid by the Government for LSL and G&CSD capital expenditures not previously paid for by the Government in accordance with Attachment C hereto, provided that said capital expenditure is in accordance with Attachment C.

III. <u>GROUND RULES</u>

The schedule for the technology transfer to LSL and the establishment of LSL as a second or alternate source for production orders is shown in Attachment A, hereto. MDAC and the JCMP shall be entitled to review, on a regular basis, both G&CSD and LSL's progress in meeting the schedule.

IV. <u>LITTON INTERNAL POLICY AND PROFIT MARGINS</u>

A. Litton Defense Systems Group Policy #104, with regard to acceptable minimum profits, shall be waived for this program. Litton Corporate personnel will not participate in any of the G&CSD or LSL proposal/price reviews nor will any information which may affect a division's pricing strategy be disclosed to either division by Litton Corporate personnel.

B. No profit level greater than ten percent (10%) shall be proposed by either G&CSD or LSL for RMUC/INE production pricing proposal purposes for firm fixed price type contracts. No profit level greater than seven percent (7%) for cost plus fixed fee contracts shall be proposed by either G&CSD or LSL for Cruise Missile production pricing purposes.

C. The parties agree that the concepts and the commitments set forth in this Memorandum of Agreement are based upon two year-multi-year contract selections.

D. Litton will not allocate workloads between the G&CSD and LSL.

V. RATE

A. MDAC and/or the JCMP hereby agrees that in implementing this second or alternate source plan in the FY 80 Production buy, G&CSD shall be awarded contracts or subcontracts calling for a minimum production rate of sixty (60) percent of the annual contract quantity and LSL shall be awarded contracts or subcontracts calling for a rate of forty (40) percent of the annual contract quantity. Table 1 shows the minimum production levels for both G&CSD and LSL and the balance to be awarded at Government discretion based on bids for varying production quantities, subsequent to the FY 80 buy. Average monthly production rate shall be determined by dividing the yearly contract quantity by 12.

B. For annual contracts requiring deliveries of less than twenty (20) systems per month, the minimum average monthly production rates shall be determined by mutual agreement of the parties hereto.

C. The determination as to work content beyond the monthly rate minimums shall be the responsibility of MDAC based upon the results of its annual contract selections.

D. The JCMP shall not be obligated to purchase from G&CSD or LSL any required Tooling and Test Equipment (TATE), other than that previously authorized by MDAC under Purchase Order No. Y60011, necessary to achieve a combined maximum rate of eighty (80) systems per month from G&CSD and LSL. Attachment D shows the required production buildup rate for guidance set elements. Litton will accept a maximum increase in any one month of up to 20% within this agreement.

E. TATE required to meet each divisions monthly delivery requirements maybe transferable between G&CSD and LSL. Duty-free entry by the U.S. Government to facilitate transfers of the TATE into the United States is assumed.

VI. SELECTION

A. MDAC shall review annually and after the first two (2) selections have the right to select one entity to become the selected source for follow-on production quantities without regard to the minimum production rate guarantees if the other entity is not acceptable based upon performance or price

B. It is agreed that both the G&CSD and LSL will be willing to enter into contractual agreements for RMUC & INE production programs with either MDAC or the Government. It is recognized that for each a different contractual relationship may exist; provided, however, that neither G&CSD nor LSL will be penalized from a selection standpoint as a result of the particular contract. As an example, for selection purposes, LSL and G&CSD quotations will be evaluated on the same basis as submitted by each entity without alteration by higher tier contractors. Pending the technology transfer and establishment of LSL as a second or alternate source for production orders, MDAC will acquire the RMUC and INE from G&CSD.

VII. AUDIT

The MDAC/JCMP shall have the right to audit both G&CSD's and LSL's books and records for the purpose of purchasing RMUC's/INE in support of competitive proposal evaluation. The MDAC/JCMP will generally utilize the DCAA to audit G&CSD's records and the Audit Service Bureau for purposes of audit verification of LSL's records.

VIII. ACCESS TO RECORDS

A. The MDAC/JCMP will be granted access to G&CSD and LSL plants and directly supplied with relevant records for the purpose of conducting will-cost studies throughout the performance of any contracts.

IX. PROPRIETARY RIGHTS

A. The MDAC/JCMP recognizes that Litton may have a limited and restricted rights-in-data position pursuant to ASPR 7-104.9 (a) in certain technical data and Litton developed software. The execution of this Memorandum of Agreement is in no way intended to be a transfer of any greater rights to or title in such data and/or software. ASPR7-104.9(b) Notice of Certain Limited Rights shall be applicable to contractual agreements with G&CSD or LSL.

B. The parties agree that the MDAC shall have the right to acquire hardware end items and spare parts from either G&CSD or LSL. MDAC shall also have the right to order component spare parts from other qualified suppliers. In order to maintain commonality, configuration control and design, all other requirements, including, but not limited to, required engineering support, handbooks, technical information and field level test equipment, if acquired from Litton, shall generally be acquired from G&CSD.

X. APPROVALS

A. A Technical Assistance and Licensing Agreement (TALA) between G&CSD and LSL covering the transfer of technology of the Cruise Missile Guidance Set elements and support equipment from G&CSD to LSL shall be submitted to the U.S. State Department for approval not later than thirty (30) days after execution of this Memorandum of Agreement.

B. Prior to submission to the U.S. State Department, the TALA shall be submitted by MDAC to Joint Cruise Missiles Project Office for approval. The JCMP shall assist in expediting the approval of this said TALA.

XI. TERMINATION

This agreement may be terminated by MDAC or JCMP if Litton, G&CSD or LSL breach this agreement or if any purchase order, contract or subcontract related to the RMUC and INE is terminated for default the rights and remedies for default shall be determined in accordance with the provisions of the respective

default clauses of the purchase orders contracts or subcontracts. In the event purchase orders, contracts or subcontracts for RMUC or INE are terminated for convenience, cancelled, or suspended, and the intent of this agreement is frustrated, this agreement may be terminated by either MDAC or JCMP with the amounts or amount to be paid as a result of the agreement limited to that provided for in Attachment C, Capital Investment Incentive.

XII. EFFECTIVITY

This Agreement shall become effective on the date signed by all parties.

XIII. DURATION

This Agreement shall continue for a period of ten (10) years, unless terminated pursuant to the provisions of Section XI herein.

XIV. CONFLICT WITH REGULATIONS OR LAWS

This agreement is subject to and superseded by any regulation or Law of the United States. In the event that any part of this agreement is superseded, then the agreement is to be altered to reflect, to the greatest extent possible, the original intent of the parties to this agreement. If a substantial change is required, such that the meaning of this agreement is no longer consistent with the original intent of the parties, then the agreement shall be terminated.

XV. ENTIRE AGREEMENT

This constitutes the entire Agreement of the parties and except for current purchase orders, supersedes and cancels any prior written or oral understandings applying to this Agreement only. This Agreement may be modified or amended only in writing signed by all parties.

APPENDIX E

This appendix presents the second sourcing agreement signed by the Joint Cruise Missile Project Office (JCMPO), the Naval Avionics Center (NAC) and McDonnell Douglas Astronautics Company (MDAC) for the production of the Scene Matching Area Correlation System (DSMAC). This appendix does not present attachment A to this agreement because, in the opinion of this researcher, it is not germaine to the second sourcing strategy utilized by JCMPO.

This Agreement for production and second-sourcing of the Digital Scene Matching Area Correlation System (DSMAC) is between the joint Curise Missiles Project of the Department of Defense of the United States Government (hereinafter referred to as JCMP), McDonnnell Douglas Astronautics Company (hereinafter referred to as MDAC) and the Naval Avionics Center of the Department of the Navy (hereinafter referred to as NAC).

WHEREAS, the design and concept of the Scene Matching Area Correlator (SMAC) was conceived and developed by NAC and was subsequently modified by NAC to become DSMAC, which uses digitized reference maps and a digitized sensor; and

WHEREAS, MDAC has conducted testing of the NAC-developed DSMAC concept under its Curise Missile Guidance set contract with JCMP (in which MDAC has agreed that the Government shall have unlimited rights in data prepared thereunder); and

WHEREAS, NAC, in response to JCMP direction will build approximately 42 Block I configured DSMAC (DSMAC I) units and the Government desires to establish MDAC (commencing with the first year's Production Buy) and a second source (commencing with a portion of the first and second year's production buys) as the production sources of Block II configured DSMAC (DSMAC II) units as a part of the Cruise Missile Program; and

WHEREAS, NAC has design cognizance of the DSMAC concept selected by the Government for use in the cruise missile;

NOW, THEREFORE, MDAC and NAC and JCMP agree as follows:

I. INTRODUCTION

A. This Agreement applies to the DSMAC II for the Joint Cruise Missile Project including, but not limited to, the conventional tactical (con-nuclear) land attack mission of the AGM-109, BGM-109, or any other cruise missile designated for such a mission. The DSMAC II is defined as a production improvement of DSMAC which is functionally equivalent to, and evolved from, the DSMAC I but is significantly smaller and may offer other improvements over DSMAC I.

B. MDAC shall productionize the DSMAC II under NAC technical direction and establish a qualified second production source. Details of the roles and responsibilities of NAC and MDAC in this endeavor shall be as set forth herein and in Attachment A.

C. NAC shall prepare and furnish to the JCMP Level 1 engineering requirements and associated lists (including drawings, data and softward) which shall provide the necessary design, engineering, manufacturing, and quality support information, directly or by reference, to enable MDAC to prepare Level 2 engineering drawings and associated lists. Level 2 drawings shall be prepared in accordance with DOD-D-1000B, 28 October 1977.

D. MDAC shall submit to the Government, for review and approval, within 45 days following signature of this MOA, a draft subcontract RFP package including sufficient technical data to allow potential second source subcontractors to understand the design and magnitude of the work tasks to the extent necessary to prepare and submit a suitable proposal. Concurrently, MDAC and NAC shall jointly prepare a draft Technology Transfer Plan (TTP) detailing tasks and requirements, showing flow of data and information, and giving schedules for the transfer of DSMAC production technology from MDAC to a second source which shall also be submitted for Government review. JCMP approval of this preliminary TTP is required prior to release of the RFP to industry. Government approval of the final version of the TTP shall occur prior to the award of a second source subcontract by MDAC.

E. MDAC shall prepare and furnish to the JCMP a design disclosure package (DDP) not later than 16 months after ATP, including drawings, data and software, which shall provide the necessary design, engineering, manufacturing, and quality support information, directly or by reference, to enable procurement from the second source without additional design effort or recourse to the original design activity, of DSMAC II that duplicates the physical and performance characterisitics of the original DSMAC II design. Engineering drawings and associated lists contained in the DDP shall be prepared in accordance with DOD-D-1000B, Level 2. The specifications, drawings, data, and software in the DDP shall be in accordance with the NAC DSMAC concepts as provided by NAC to MDAC and represent a production design extension of the DSMAC I. This DDP is subject to NAC and JCMP approval prior to initiation of production. The government shall have the option to procure from MDAC or NAC a Level 3 drawing/procurement package at any time.

F. MDAC shall conduct a competition to select a second-source subcontractor who will support MDAC in the preparation of the DDP to the extent necessary to ensure the suitability of that package for production by either party. MDAC shall conduct the competitive subcontracting process using subcontracting procedures previously followed by MDAC for JCMP programs such as the Common Weapons Control System. (Such procedures are considered to conform to what is referred to by the General Accounting Office as the "Federal Norm.") In order to assure that the process is fair and conforms to the general basic principals governing award of contracts by the Federal Government, the JCMP shall review the MDAC-prepared Request for Proposal (RFP), oversee the conduct of the source selection process (including the specific source selection criteria to be used) and review the proposed source selection prior to the contracting officer granting consent to award of a subcontract to a selected source. Following source selection, JCMP shall continue to monitor and oversee MDAC actions throughout the program.

G. Upon completion of the DDP, fulfillment of the TTP (described in D above), and qualification, MDAC shall certify the second-source subcontractor to become an independent source of Block II DSMAC production.

H. After the second source has demonstrated a DSMAC II production capability and is certified by MDAC, then MDAC and the second source shall sever their contractor/subcontractor relationship and shall become independent sources for production of the DSMAC II with neither having any responsibility for cost, schedule, or performance for the other entity.

II. FINANCIAL CONSIDERATION

A. The costs incurred by a second source related to technology transfer, qualification, or the development of the ability to build the DSMAC II will not be chargeable to a MDAC contract, or any subcontract thereunder, with the JCMP or any other government agency, without specific JCMP approval.

B. There shall exist no royalty charges or license fees payable to MDAC, NAC, or the JCMP for the transfer of technical data, computer softward, equipment, and capability relative to the DSMAC.

C. The development phase DSMAC II contract through preproduction is anticipated to be a 3% fixed fee plus up to 12% award fee. Actual fee for the resultant contract will be subject to negotiations. The award will be determined on the basis of technical, cost and schedule performance by MDAC and the success of the second source in being able to produce and qualify the DSMAC II. Award Fee shall not be reduced because of MDAC performance or second source ability to produce or be qualified due to factors beyond the control or without the fault or negligence of MDAC.

D. In consideration for MDAC using its own funds to initially implement this MOA, the JCMP agrees that if 4000 production units of DSMAC II are not purchased by JCMP from MDAC within the first seven years of the effective date of this Agreement the Government shall reimburse MDAC for a portion of the cost of company funded DSMAC development. In no case shall the maximum Government liability under this provision exceed the corporate funds expended by MDAC or the following amounts, whichever is less:

Fiscal Year 1980	$500,000
Fiscal Year 1981	$1,000,000
and on until *Liquidation	

The above liability shall be reduced by the amount of 1/4000 for each DSMAC II unit delivered by MDAC up to the 4000th unit..

*Liquidation period as defined herein refers to a period of seven years from signature of this MOA or the time when procurement of 4000 DSMAC II production units is attained, whichever comes first.

E. If the second second source is not qualified by the time he is scheduled to deliver the first production unit and the reasons for his late qualification are within MDAC's control or due to the fault of negligence of MDAC, then the following provisions shall apply to protect government delivery schedules and to incentivise successful completion of second source qualification:

1. MDAC shall supply additional DSMAC II units to make up the second-source shortfall, within 4 months of their scheduled delivery dates. This responsibility shall not exceed the number of non-competed units the second source is to deliver each year for the first and second year of production.

2. The government shall not be required to pay for these additional MDAC supplied units until such time as the second source is qualified. The government's liability shall be limited to only 50% of the maximum progress payments to MDAC for the above substituted second source production units for any particular fiscal year buy.

3. These units shall not increase the total buy from MDAC, but shall only constitute a cost free loan of units until such time as the second source is qualified.

4. At the sole discretion of JCMP, the right is reserved to refuse to accept production units from the second source until that source is qualified, to refuse to make payment for any such units, or to refuse to make progress payments between the time qualification is scheduled to be complete and the time that qualification is actually complete.

F. MDAC shall accomplish the DSMAC II technology transfer to the selected source in such a manner that the second source is certified as stipulated in Paragraph III.F no more than 24 months following; 1) the acceptance of the purchase order from MDAC, and 2) the successful completion of the DSMAC II critical design review. Should this certification not be accomplished within 24 months JCMP reserves the right to limit payment of award fee to fifty percent of the development phase award fee pool. Should the certification be delayed by more than three months beyond this period JCMP reserves the right to limit

payment of award fee to fifty percent of the remaining award fee. JCMP shall not limit payment of award fee as provided in this paragraph if schedule delay is caused by factors beyond the control or without the fault or negligence of MDAC.

G. That portion of MDAC responsibility under the MOA which is to be funded by the Government shall be as delineated in the DSMAC II FSED work statement which shall be a part of this Agreement by reference.

III. <u>GROUND RULES</u>

A. MDAC shall ensure that the technology transfer and manufacturing processes information is provided to the selected second source (as a subcontractor to MDAC) in a timely manner to enable the second source to produce 15% of the first year's production buy and to compete with MDAC, as a prime contractor, for a portion of the second production year and follow-on production buy, if they should occur.

B. The annual production procurement split will be as specified in Table I. The criteria for award of the competed quantity of units shall be as established by JCMP with MDAC, and second source consultation. The criteria will include cost, past performance, reliability, and quality as a minimum. Lack of qualification shall not constitute grounds not to award any or all of the competitive portion of the buy to the second source unless the government determines that the second source is not a "responsible" source (as "responsibility" is defined in DAR 1-900). It is the intention of JCMP to divide the annual competed quantity of units in an equitable manner as long as both vendors remain acceptable for technical, schedule, and cost considerations.

C. JCMP shall have the right to select either MDAC or the second source to become the sole source for any or all of the follow-on production quantities for the third production year and beyond if the othr entity is not accpetable, JCMP shall have the right to develop additonal sources of manufacture.

D. Prior to completion of the technology transfer and the establishment of a second source for production of DSMAC II, MDAC shall be responsible for DSMAC II production in such quantities and to specific contractual schedules as necessary to fulfill the Government's requirements.

E. None of the above shall preclude the government from using NAC as a production source should both MDAC and the second source prove unable to meet the government's required production rate.

F. "Qualification" of the second source shall consist of successful asseptance testing (to the same JCMP approved ATP used for MDAC DSMAC II units) of at least 2 units and the following environmental testing at the qualification test levels: 1) Vibration; 2) Temperature (High & Low); 3) Humidity; 4) Altitude, and 5) Explosive Atmosphere.

Prior to the above testing, MDAC and the JCMP shall inspect samples of the hardware and the production facilities and conduct a Production Readiness Review (PRR). If any unacceptable items are discovered, the second source and JCMP shall be given written notification immediately so that corrective action can be completed before the start of environmental testing.

At the successful conclusion of the above review and testing, MDAC shall certify that the second source is a valid production source.

G. It is understood by all parties that no agreement; including but not limited to Memoranda of Agreement (MOAs), Memoranda of Understanding (MOUs), TTPs, Purchase Orders, Configuration or Program Management Plans, etc.; may be signed and/or entered into between MDAC and the selected second source without the expressed prior approval of the JCMP.

H. JCMP and MDAC shall form a design to cost team to establish the production cost thresholds, goals and challenges for DSMAC II. This shall be done in parallel with the design and development program. The values shall be established by the time of authorization for pilot production using independent, validated cost estimating techniques. Appropriate learning curves shall also be established and an inflation escalation value shall be established each year.

I. The DSMAC II unit referred to herein will be designed to meet the EMP environment specified in CMGS specification AS4876 G.

IV. SCHEDULE

A. MDAC shall productionize the DSMAC II and produce engineering model units in accordance with schedule I.

B. MDAC shall develop the level 2 production drawings and produce the flight test, pre-production, and initial production units in accordance with schedule 2. The first year's production buy is shown as FY 82 for example only.

C. MDAC shall select and qualify the second source in accordance with schedule 2.

V. AUDIT

The JCMP shall have the right to audit both MDAC's and the second source's books and records for the purpose of validating costs in support of competitive proposal evaluations. The JCMP will utilize the Defense Cost Audit Agency (DCAA), with assistance from the resident or regional Government administrative office, to audit the pertinent records.

VI. ACCESS TO RECORDS

The JCMP will be granted access to MDAC's and the second source's plants and be supplied directly with relevant records for the purpose of conducting Production Readiness Review (PRRs) and will-cost studies throughout the performance of any contracts.

VII. PROPRIETARY RIGHTS

A. JCMP and NAC state that the NAC design of SMAC and DSMAC are Government-owned designs and all rights and patents are owned by the Government. MDAC states that it has no proprietary claims to the NAC designs of SMAC or DSMAC. Any MDAC recommended changes or improvements subsequently incorporated into the basic NAC designs are subject to Government review and approval. Upon approval, these changes are to be considered subject inventions* and the Government shall have unlimited rights* in all data* covering such changes or improvements and a paid-up license in any MDAC patents on the subject matter. (*as defined in DAR).

B. The parties agree that JCMP shall have the right to acquire hardware end-items and spare parts from either MDAC or the second source. JCMP shall also have the right to order, or direct MDAC to order, component spare parts

from other qualified suppliers. In order to maintain commonality of design, MDAC will be the configuration control agency for DSMAC II, except for DSMAC-resident softward. NAC shall have a member (with veto power) on the MDAC DSMAC configuration control baord.

VIII. TERMINATION

This Agreement may be unilaterally terminated by JCMP if breached by MDAC. This agreement may be unilaterally terminated by MDAC if breached by JCMP. If any purchase order, contract, or subcontract related to the DSMAC is terminated for default, the rights and remedies of the parties shall be governed by the provisions of the respective default clause of the purchase orders, contracts, or subcontracts. In the event purchase orders, contracts, or subcontracts for DSMAC are terminated for convenience, cancelled, or suspended, and the intent of this agreement is frustrated, this agreement may be terminated by the JCMP. Any disagreement to the amount or amounts to be paid as a result of this agreement shall be resolved pursuant to the provisions of the Disputes Clause of the applicable contract.

IX. EFFECTIVITY

This Agreement shall become effective on the date signed by all parties.

X. CONFLICT WITH REGULATIONS OR LAWS

This agreement is subject to and superseded by any regulation or law of the United States. In the event that any part of this Agreement is superseded, then the Agreement is to be altered to reflect, to the greatest extent possible, the original intent of the parties to this Agreement. If a substantial change is required, such that the meaning of this Agreement is no longer consistent with the original intent of the parties, then the Agreement shall be terminated.

XI. ENTIRE AGREEMENT

This constitutes the entire Agreement of the parties and, except for current purchase orders, supersedes and cancels any prior written or oral understandings applying to this Agreement only. This Agreement may be modified or amended only in writing signed by all parties.

SELECTED REFERENCES

1. Aerospace Space Daily, "Boeing Chosen over General Dynamics as AF's Cruise Missile Contractor," p. 1, March 26, 1980.

2. Adams, Walter, The Structure of American Industry. New York: Macmillan Publishing Co., Inc., 1971.

3. Alducin, Donald G., "Leader/Follower ALCM Production Procurement," Joint Cruise Missiles Project Office JCM-25, dtd. December 7, 1979.

4. Anderson, D. R. and Schmidt, L. A., Practical Controllership, Irwin: 1973.

5. Andress, Frank J., "The Learning Curve as a Production Tool," Reprint from Harvard Business Review, January-February 1954.

6. Bemis, John C., "Production Rate as an Affordability Issue," Paper presented at Ninth Annual DOD/FAI Acquisition Research Symposium, Annapolis, Md., June 9-11, 1980, pp. 1-35.

7. Defense Acquisition Regulation Working Committee, Draft version of "Competition in Production State, DAR Case 79-42," undated.

8. DeMong, Richard F. and Strayer, Daniel E., "Incentive Contracting, The Underlying Theory," Paper presented at the Ninth Annual DOD/FAI Acquisition Research Symposium, Annapolis, Md., pp. 10-3, June 9-11, 1980.

9. Drinnon, J. W. and Gansler, J. S., "Producting the Costs and Benefits of Competitive Production Sources," The Analytic Sciences Corporation, Arlington, Va.

10. Getler, Michael, "Cruise Missiles: U.S. Reliant and New Technology," The Washington Post, p. A-1, June 30, 1980.

11. Hammon, Colin and Graham, David R., "Estimation and Analysis of Navy Ship Building Program Disruption Costs," Paper presented at the Ninth Annual DOD/FAI Acquisition Research Symposium, Annapolis, Md., June 9-11, 1980.

12. Joint Cruise Missile Project, Director, "House Appropriations Committee Studies and Investigations Staff (HAC S&I's) Study of the Extent of Price Competition in DOD Contracting," Letter to Chief Naval Material, JCM-2232RTM, Ser. 038, dtd. February 26, 1980.

13. Joint Cruise Missile Project Office, The Air Launched Cruise Missile (ALCM) Request for Proposals, N00019-79-R-1000 issued on 22 December 1978.

14. Joint Cruise Missile Project Office, "The ALCM Procurement Plan No. P80-01-80.01 dated 14 March 1979.

15. Joint Cruise Missile Project Office, Internal Memorandum, Subj: "Legal Review of Proposed DSMAC MOA, Revision G of 20 May 1980," dtd. 6 June 1980.

16. Joint Cruise Missile Project Office, "Joint Cruise Missiles Project Second Sourcing Briefing," undated.

17. Joint Cruise Missile Project Office, "Memorandum of Agreement," between the U.S. Government and McDonnell Douglas Astronautics Company concerning the Digital Scene Matching Area Correlation System (DSMAC).

18. Joint Cruise Missile Project Office, "Memorandum of Agreement," between the U.S. Government, McDonnell Dougals Astronautics Company, and Litton Systems, Inc., concerning the Cruise Missile Guidance Set Elements (RMUC&INE), May 1979.

19. Joint Cruise Missile Project Office, U.S. Government and William Research Corporation (WRC) Licensing Agreement, "Use of WRC Technical Data and Computer Software by the Government Pertaining to the F-107 Series Engine," dated 29 August 1978.

20. Joint Cruise Missile Project Office, "Submission to the General Accounting Office in Response to the Protest by Singer Company, Inc., Kearfott Division," RE:B-193270, 3 April 1979.

21. Lamm, David V., "Dual Sourcing in Major Weapon Systems Acquisition," Proceedings - Seventh Annual Acquisition Research Symposium, held at Hershey, Pa., p. 347, May 31-June 2, 1978.

22. Lovett, Ed and Norton, Monte, "Determining and Forcastint Savings Due to Competition," National Contract Management Journal, Vol. 13, Summer 1979, pp. 18-27.

23. Major Systems Acquisition Reform -- Part II, Hearings before the Subcommittee on Federal Spending Practices, Efficiency, and Open Government, June 16, 1975, U.S. Government Printing Office.

24. Nielsen, Robert A. and LoCascio, Vincent, "Computer-Assisted Planning in the Public Sector," Management Advisor, p. 84, May-June 1-73.

25. Office of Management and Budget, Office of Federal Procurement Policy, Pamphlet No. 1, "Major System Acquisition - A Discussion of the Application of OMB Circular A-109," August 1976.

26. Parry, Dennis Scott, "Second Sourcing in the Acquisition of Major Systems," September 1977 Thesis, Naval Postgraduate School, Monterey, Ca., September 1979.

27. Perry, William J., Under Secretary for Research and Engineering, statement before the 95th Congress Joint House and Senate Armed Services Committee on 14 April 1978.

28. Scherer, F. M., The Weapons Acquisition Process: Economic Incentives, Division of Research, Graduate School of Business Administration, Harvard University, Boston, Me., 1964.

29. Sellers, Benjamin, LCDR, SC, USN, "Competition in the Acquisition of Major Weapon Systems," Naval Postgraduate School, Monterey, Ca., September 1979.

30. Sherman, Stanley N., "Fitting the Contract to the Acquisition," Paper presented at the Ninth Annual DOD/FAI Acquisition Research Synposium, Annapolis, Md., pp. 10-31, June 9-11, 1980.

31. Smith, G. K., "An Overview of Acquisition Policy Effectiveness in the 1970's," Rand Corporation, Santa Monica, Ca., February 1979.

32. Spencer, David T., "Alternatives for Shortening the Acquisition Process," Defense Systems Management Review, Vol. 2, Number 4, Autumn 1979, p. 36.

33. Stolarow, Jerome, "Statement before the House Committee on Government Operations, Subcommittee on Legislation and National Security on Weapons Systems Cost," delivered June 25, 1979.

34. Thompson, Charles W. N. and Rubenstein, Albert H., "The Leader/Follower Concept in Acquisition," Final Report on contract F33615-79-C-5073. dtd. 15 November 1979.

35. Turban, Efraim and Meredith, Jack R., Fundamentals of Management Science, Dallas, Texas: Business Publications, Inc., 1977.

36. Tersine, Richard J. and Altinus, Cyrus A., "Probabilistic Profit Planning: A Feasible Approach," Management Advisor, May-June 1974, p. 46.

37. U.S. Department of Defense, Department of Defense Directive 5000.1, "Major System Acquisitions," dtd. March 19, 1980.

38. U.S. Department of Defense, Department of Defense Directive 5000.2, "Major System Acquisition Procedures," March 19, 1980.

39. U.S. Department of Defense, Defense Acquisition Regulations, Washington, D.C.: U.S. Government Printing Office, July 1976.

40. U.S. Department of Defense, Secretary's Memorandum for the President, Subj: "Approval for the Cruise Missile Program as a Program of Highest National Priority," dtd. 26 January 1978.

41. U.S. Department of Defense, Under Secretary for Research and Engineering (the known as Director of Defense Research and Engineering), "Joint Cruise Missile Program Organizational Structure," Memorandum for Secretary for the Air Force and Secretary for the Navy, dtd. 30 September 1977.

42. U.S. General Accounting Office, "Impediments to Reducing the Costs of Weapon Systems," PSAD 80-6, November 8, 1979.

43. U.S. Department of the Navy, Naval Material Command Instruction 5430.59, "Joint Cruise Missile Project; designatio of," dtd. 6 February 1978.

44. Walsh, Bill, "View from the Top," Reprinted from Military Electronics/Countermeasures, undtd.

45. Womer, Norman K., "Learning Curves, Production Rate, and Program Costs: An Illustration of Results," paper presented at the Seventh Annual Acquisition Research Symposium, Hershey, Pa., May 31-June 2, 1978, p. 83.

46. Zbylut, Robert S., "A Case Study of the Usefulness of the Cost/Schedule Control System Criteria (C/SCSC). Defense Documentation Center, AD923129, Dept. 1974.

INITIAL DISTRIBUTION LIST

		No. Copies
1.	Defense Technical Information Center Cameron Station Alexandria, Virginia 22314	2
2.	Library, Code 0142 Naval Postgraduate School Monterey, California 93940	2
3.	Defense Logistics Studies Information Exchange U.S. Army Logistics Management Center Fort Lee, Virginia 23801	1
4.	Department Chairman, Code 54 Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
5.	Asst Professor D. V. Lamm, Code 54Lt Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	5
6.	Professor L. Darbyshire, Code 54Da Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
7.	Director, Joint Cruise Missile Project Office Code 02 Department of the Navy Washington, D.C. 20361	3
8.	Director Joint Cruise Missile Project Office Code 28213 Department of the Navy Washington, D.C. 20361	1
9.	LCDR Rosemary E. Nelson 719 S. Wilbur Walla Walla, Washington 99632	1